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Capt USAF

RESTRICTED

AN 16-30APA10-3
(Old No. AN-08-30APA10-3)

HANDBOOK

MAINTENANCE INSTRUCTIONS

PANORAMIC ADAPTER AN/APA-10

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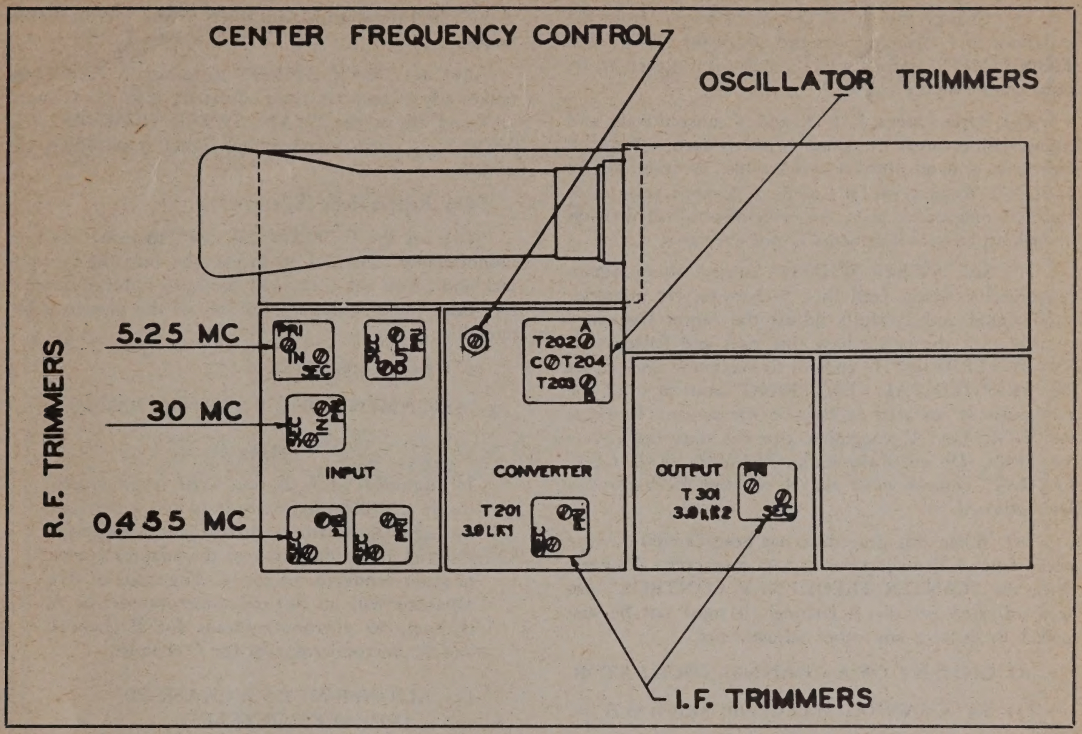

Figure 5-2. Alignment Adjustments

(4) Adjust the trimmers on T-201 and T-301 until maximum deflection of the picture is obtained reducing the input signal as necessary to keep the trace on the screen. This is the preliminary i-f adjustment. The final adjustment cannot be made until the B-channel oscillator and frequency modulator are aligned.

c. ALIGNMENT OF B-CHANNEL FREQUENCY MODULATED OSCILLATOR.

Note

The B-channel oscillator must be aligned before the other oscillator channel alignment operations are attempted.

(1) Set "CHANNEL SELECTOR" in the B position.

(2) Set "SWEEP WIDTH" control at maximum.

(3) Set the B channel "DEVIATION LIMIT" control to maximum (clockwise).

(4) Feed an unmodulated signal of 5.25 megacycles into the B-jack on the panel. Adjust the signal strength from the generator until a pulse about ½" high is obtained on the screen.

(5) Adjust the B-oscillator inductance trimmer on T-203 until the peak is centered at zero on the horizontal axis.

(6) If a symmetrical pulse is not obtained when the "SWEEP WIDTH" control is rotated one fourth from its maximum clockwise position, the i-f trimmers on T-201 and T-301 must be carefully adjusted until the curve is fairly symmetrical and equally balanced on either side of the center line. Normally these trimmers will require some readjustment.

d. CENTER FREQUENCY ADJUSTMENT.

(1) Set the "SWEEP WIDTH" control to maximum (clockwise).

(2) Feed a 5.75-megacycle signal into the B-jack and adjust the "B DEVIATION LIMIT" control until the pulse is centered at the right hand 5 on the screen.

(3) Change the signal frequency output from the generator to 4.75 megacycles and adjust the "CENTER FREQUENCY" control until the pulse is centered at the left hand 5 on the screen.

(4) Change the signal frequency output from the generator to 5.25 megacycles and adjust the B inductance trimmer on T-203 until the pulse is centered at zero on the screen.

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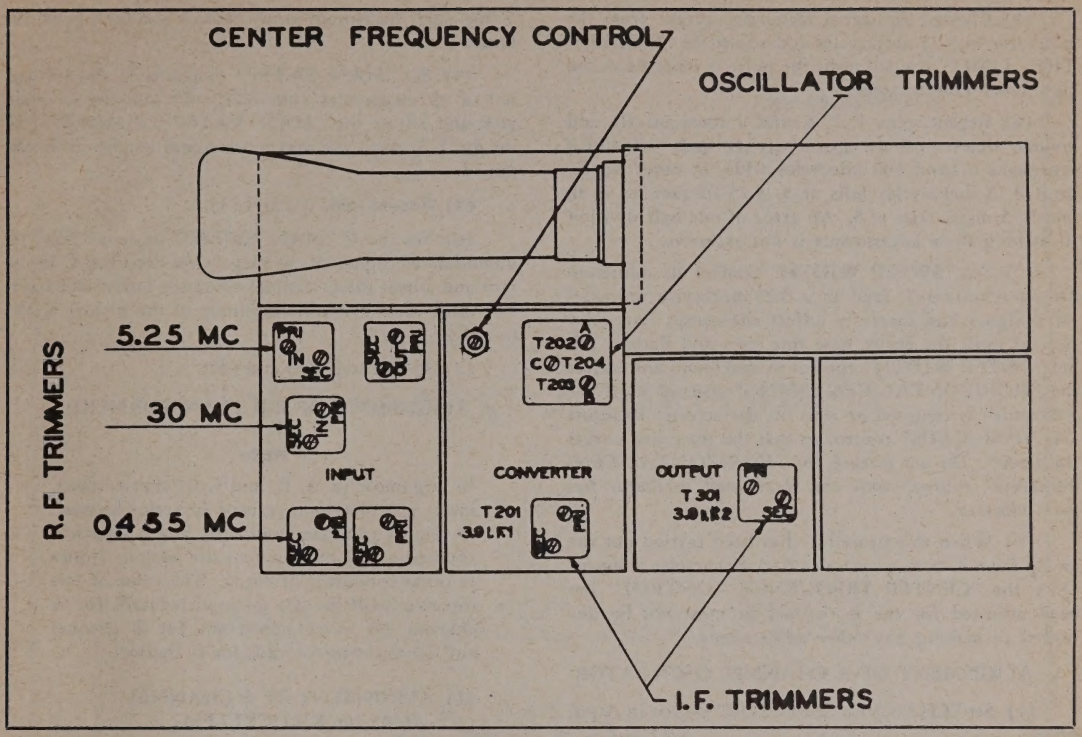

Figure 5-2. Alignment Adjustments

(4) Adjust the trimmers on T-201 and T-301 until maximum deflection of the picture is obtained reducing the input signal as necessary to keep the trace on the screen. This is the preliminary i-f adjustment. The final adjustment cannot be made until the B-channel oscillator and frequency modulator are aligned.

c. ALIGNMENT OF B-CHANNEL FREQUENCY MODULATED OSCILLATOR.

Note

The B-channel oscillator must be aligned before the other oscillator channel alignment operations are attempted.

(1) Set "CHANNEL SELECTOR" in the B position.

(2) Set "SWEEP WIDTH" control at maximum.

(3) Set the B channel "DEVIATION LIMIT" control to maximum (clockwise).

(4) Feed an unmodulated signal of 5.25 megacycles into the B-jack on the panel. Adjust the signal strength from the generator until a pulse about ½" high is obtained on the screen.

(5) Adjust the B-oscillator inductance trimmer on T-203 until the peak is centered at zero on the horizontal axis.

(6) If a symmetrical pulse is not obtained when the "SWEEP WIDTH" control is rotated one fourth from its maximum clockwise position, the i-f trimmers on T-201 and T-301 must be carefully adjusted until the curve is fairly symmetrical and equally balanced on either side of the center line. Normally these trimmers will require some readjustment.

d. CENTER FREQUENCY ADJUSTMENT.

(1) Set the "SWEEP WIDTH" control to maximum (clockwise).

(2) Feed a 5.75-megacycle signal into the B-jack and adjust the "B DEVIATION LIMIT" control until the pulse is centered at the right hand 5 on the screen.

(3) Change the signal frequency output from the generator to 4.75 megacycles and adjust the "CENTER FREQUENCY" control until the pulse is centered at the left hand 5 on the screen.

(4) Change the signal frequency output from the generator to 5.25 megacycles and adjust the B inductance trimmer on T-203 until the pulse is centered at zero on the screen.

(5) Change the signal frequency output from the generator to 5.75 megacycles and adjust the "B DEVIATION LIMIT" control until the pulse is centered at the right hand 5 on the screen.

(6) Repeat steps 1, 2, 3, and 4 consecutively and enough times until the space between each +5 and 0 represents a band 500 kilocycles wide, in other words, until 4.75 megacycles falls at 5, 5.25 megacycles at 0, and 5.75 megacycles at 5. An error of one half division in making these adjustments is not excessive.

(7) Set "SWEEP WIDTH" control to minimum (counterclockwise), feed in a 5.25-megacycle unmodulated signal and carefully adjust the center frequency control until the entire base line rises and flattens off. Set "SWEEP WIDTH" control to maximum and adjust the "HORIZONTAL CENTERING" control until the 5.25 pulse is centered at zero on the screen. Readjust the "HOR. GAIN" control so that the trace just covers the screen. *Do not disturb the "HORIZONTAL CENTERING" control until the A channel oscillator has been adjusted.*

(8) When this procedure has been carried out the sweep from 4.75 megacycles to 5.25 megacycles is linear. Once the "CENTER FREQUENCY CONTROL" has been adjusted for the B channel, it must not be disturbed in making any other adjustments.

e. ALIGNMENT OF A CHANNEL OSCILLATOR.

(1) Set "CHANNEL SELECTOR" switch in A position.

(2) Set "SWEEP WIDTH" control at maximum clockwise position.

(3) Feed an unmodulated signal at 455 kilocycles into the A jack. Adjust the A oscillator inductance trimmer on T-202 until the peak is centered on the zero line on the screen.

(4) Set "SWEEP WIDTH" control at minimum. Feed a 455 kilocycle unmodulated signal into the A jack and readjust the A oscillator inductance trimmer core on T-202 until the base line rises in a gradual arc with its maximum at the center of the screen.

(5) Turn off the modulation and set the signal generator to 505 kilocycles. Set the "SWEEP WIDTH" control to maximum. Adjust the "A DEVIATION LIMIT" control *(29 on fig. 2-7)* and note whether the peak falls at 5 on the screen. Repeat the A band oscillator adjustments.

f. ALIGNMENT OF C-CHANNEL OSCILLATOR.

(1) Set "CHANNEL SELECTOR" switch in C position.

(2) Set "MAN. SWEEP" control to the plus 1 mark.

(3) Feed a 31-megacycle unmodulated signal into the C Input jack. An input of at least one volt should be used. Adjust the C channel inductance trimmer on T-204 until maximum amplitude of the picture is obtained.

(4) Set "MAN. SWEEP" to minus 1. Feed a signal of 29 megacycles (unmodulated) into the C input jack and adjust the "MAN. SWEEP TRIMMER" *(32 on fig. 2-7)* until the maximum signal amplitude is obtained.

(5) Repeat steps (3) and (4).

(6) Set the C "MAN. SWEEP" to zero. Feed an unmodulated signal of 30 megacycles into the C input jack and adjust the C channel oscillator inductance trimmer until the maximum amplitude of the picture is obtained.

(7) Repeat steps (3) and (4).

g. ALIGNMENT OF R-F TRANSFORMERS.

Note

In alignment of A, B, and C r-f transformers, insert a 27,000-ohm resistor in series between the signal generator and cord, and a capacitor shunted across the input to the adapter (inner to outer conductor of cord). The value of this capacitor will be 100 micromicrofarads for A channel, 50 micromicrofarads for B channel and 50 micromicrofarads for C channel.

(1) ALIGNMENT OF A CHANNEL (405-505 KILOCYCLES).

(a) Feed a multivibrator or pulse generator signal into Cord CD-800 in series with 27,000-ohm resistor and shunted by a capacitor of 100 micromicrofarads.

(b) Vary the frequency from 405 to 505 kilocycles and adjust the trimmers on the A-channel r-f transformers until the peaks fall at 415 and 495 kilocycles. Adjust the trimmers until the peak-to-trough ratio is approximately 7.

(c) Remove the multivibrator or pulse generator input lead and connect a sine wave generator. (Alignment can be made using sine wave signal generator alone.)

(d) Feed a 455-kilocycle signal into grid of V-101 and adjust the secondary trimmer of the A-band output transformer (T-104) for peak deflection.

(e) Feed 495-kilocycle signal into grid of V-101 and adjust the primary trimmer of the A-band output transformer for maximum deflection.

(f) Feed 415-kilocycle signal into grid of V-101 and readjust the secondary trimmer of the A-band output transformer for maximum deflection.

(g) Feed 455-kilocycle signal into input of Cord CD-800 (with resistor and capacitor mentioned previously) to the A-channel input jack and adjust secondary trimmer of A-band input transformer (T-101) for maximum deflection.

AN 08-30APA10-3

HANDBOOK OF MAINTENANCE INSTRUCTIONS

for

PANORAMIC ADAPTER AN/APA-10

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(For Official Use Only)

Approved 7 DECEMBER 1944

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SAFETY NOTICE

This equipment employs high voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:-

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:-

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument- boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

★

Unsatisfactory Report

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54 listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

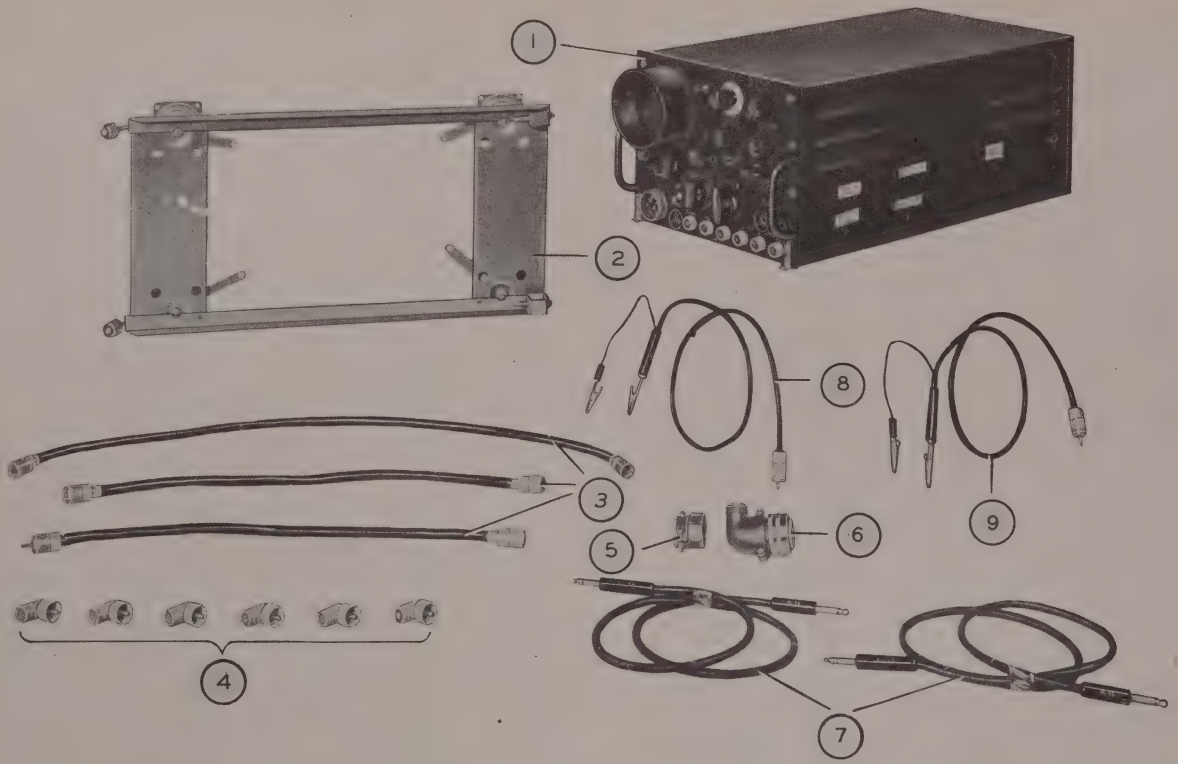
For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.



(1) Indicator ID-60/APA-10
(2) Mounting Base MT-171/U
(3) Cord CD-800
(4) Adapter M-359
(5) Adapter AN3057-12
(6) Plug AN3108-22-4S
(7) Audio Cables (made from Cordage CO-119-B and with Plug PL-68 and Plug PL-55)
(8) Cord CG-113/AP (Low Impedance CRO Probe)
(9) Cord CG-53/AP (High Impedance CRO Probe) two supplied.

Figure 1-1. Panoramic Adapter AN/APA-10

FORWORD

This book will be supplemented in the near future with additional information.

SECTION I
GENERAL DESCRIPTION

1. GENERAL.

a. Panoramic Adapter AN/APA-10 is an airborne equipment which, when used with certain radio receivers, presents visually and aurally a portion of the radio spectrum. (See fig. 1-1.) By the use of this equipment signals can be discovered and identified, and their frequency, strength, and type of modulation can be determined. There are four types of presentation:

(1) Panoramic presentation provides a picture of all signals present within a band of frequencies, and shows the nature of each signal, its frequency, and its relative strength.

(2) Aural presentation enables an operator to tune a receiver to an exact signal frequency and to hear coding or voice modulated signals.

(3) Oscillographic presentation enables an operator to examine one particular signal, to determine the type modulation used and to see any coding which might be present.

(4) Oscilloscopic presentation enables the operator to use this instrument as an ordinary oscilloscope in testing other devices. (See fig. 1-2.)

b. Panoramic Adapter AN/APA-10 has four channels:

(1) Channel A provides aural and panoramic presentation of a 100-kilocyle band within the frequency range of Radio Receiving Set AN/ARR-7 ( ), from .5 to 28 megacycles.

(2) Channel B provides aural and panoramic presentation of a 1000-kilocycle band within the frequency range of Radio Receiving Set AN/ARR-5 ( ), from 27.8 to 143 megacycles.

(3) Channel C provides aural and oscillographic presentation of a 2000-kilocycle band when used with Radio Receiving Equipment AN/APR-1 ( ), AN/APR-4 ( ), or Radio Set SCR-587-A. The frequency range depends on the receiver used; Radio Set SCR-587-A covers a range from 80 to 3000 megacycles.

(4) Channel CRO enables the equipment to serve as an ordinary oscilloscope in testing other equipment.

c. This equipment operates from a 105—to 125-volt, 400- to 2600-cycle, single phase a-c power source. The power input is approximately 140 watts and the current drain is about 1.3 amperes. By changing taps on the power transformer (Chassis No. 5) the instrument can be altered to operate from 75- to 85-volt, 400- to 2600-cycle a-c power source.

d. This handbook covers Panoramic Adapter AN/APA-10 (XA-2), serial numbers 1 through 10; and Panoramic Adapter AN/APA-10, serial number from 11.

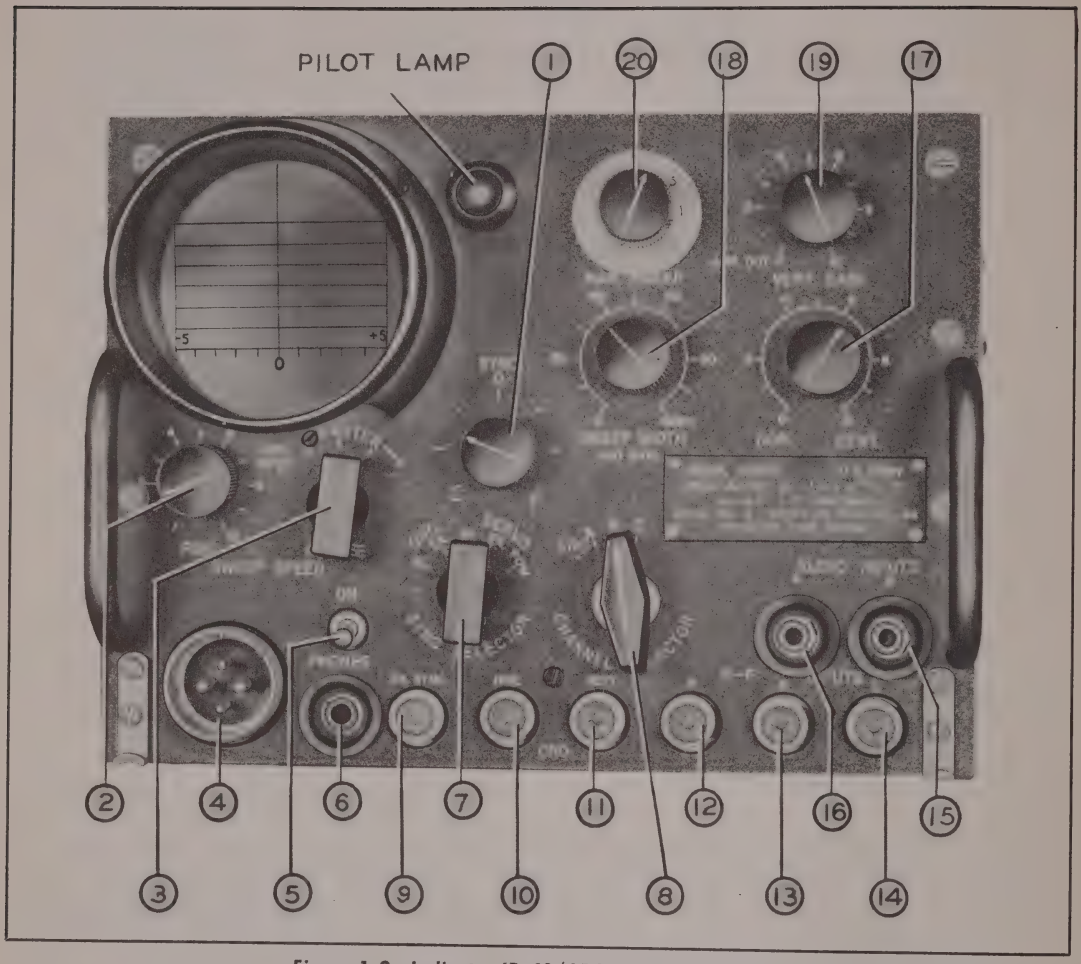


Figure 1-2. Indicator ID-60/APA-10—Panel View

2. EQUIPMENT SUPPLIED.

The following equipment is supplied with Paroramic Adapter AN/APA-10

Quantity	*Name of Unit*	*Army Type Designation*	*Navy Type Designation*	*Overall Dimensions (inches)*	*Weight (pounds)*	*Numerical Series Reference Symbols*
1	Indicator	ID-60/APA-10	ID-60/APA-10	19 9/16 x 10 1/4 x 7 5/8	40	
1	Mounting Base	MT-171/U	MT-171/U	22 3/4 x 10 3/8 x 2 1/2	2.18	
1	High Impedance CRO Probe Cord	CG-53/AP		30 (length)	.25/ft.	
1	Low Impedance Sync Probe Cord	CG-113/AP		30 (length)	.25/ft.	
1	Cord	CG-180/AP		30 (length)		
2	Cords	CD-800		20 (length)	.276	
1	Cord	CD-800		30 (length)	.370	
1	Plug	AN3108-22-4S	AN3108-22-4S	3 1/32 x 1 9/32 x 2 1/16	.216	
2	Plugs	PL-68		3.22 x .5 dia.	.060	
2	Plugs	PL-55		3.61 x .5 dia.	.0625	
6	Adapters	M-359		3/4 x 1 1/4 x 1 1/4	.076	
1	Adapter	AN3057-12	AN3057-12	1 9/16 x 1 3/16	.060	
	Cordage	CO-119-B		As required	.410	

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The following equipment is required but not supplied with Panoramic Adapter AN/APA-10

Quantity	*Name of Unit*	*Army Type Designation*	*Navy Type Designation*	*Required Characteristics*
1	Radio Receiving Set	AN/ARR-7 ( )	AN/ARR-7 ( )	Average i-f frequency 455 kilocycles
1	Radio Receiving Set	AN/ARR-5 ( )	AN/ARR-5 ( )	Average i-f frequency 5.25 megacycles
1	Radio Receiving Equipment	AN/APR-1	AN/APR-1	
	or			
	Receiving Equipment	AN/APR-4	AN/APR-4	
	or			
	Radio Set	SCR-587 ( )		Average i-f frequency 30 megacycles
1	Pair Headphones and Cord			Either low impedance (600 ohms) or high impedance (8000 ohms).
1	Power Cable			Two-conductor cable capable of carrying 10 amperes.

Note: Not available at time of printing.

Figure. 1-3. Panoramic Adapter AN/APA-10—Chassis Disassembled

4. DESCRIPTION OF MAJOR ASSEMBLY.

Panoramic Adapter AN/APA-10 is made up of seven sub-assemblies each mounted on its own chassis, and of plug-in construction. (See figs. 1-3 and 1-4.) Connections are made to the main chassis by means of banana pin jacks. For maintenance purposes, a defective chassis can be quickly replaced by a good one and it is not often necessary to send the entire unit to a repair depot. The entire assembly is contained in a Standard Aircraft Radio Case, SARC B1-D, and is mounted on Mounting Base MT-171/U. Controls and the screen of the cathode ray tube are on the front panel as shown in figure 1-2.

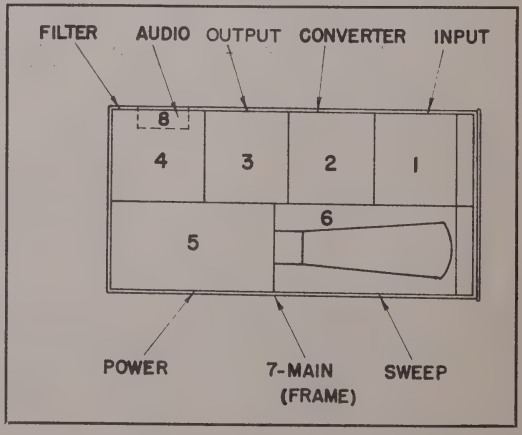


Figure 1-4. Plug-in Chassis—Top View Assembled

5. INTERCHANGEABLILITY OF PARTS.

Equipment	*Army Type Designation*	*Navy Type Number*	*AN/APA-10 (XA-2)*	*AN/APA-10*
Indicator	ID-60/APA-10	ID-60/APA-10	ID-XA-5/APA-10 (XA-2)	ID-60/APA-10
High Impedance CRO Probe	CG-53/AP		CG-53/AP	CG-53/AP
Low Impedance Sync Probe	CG-113/AP		CG-113/AP	CG-113/AP
High Impedance Probe Cord	CG-180/AP		CG-180/AP	CG-180/AP
Cord (20″)	CD-800		CD-800	CD-800
Cord (30″)	CD-800		CD-800	CD-800
Plug	AN3108-22-4S	AN3108-22-4S	AN3108-22-4S	AN3108-22-4S
Plug	PL-68		PL-68	PL-68
Plug	PL-55		PL-55	PL-55

NOTE: All major units of the models are interchangeable. Sub-assemblies of the indicator are not, however, necessarily interchangeable.

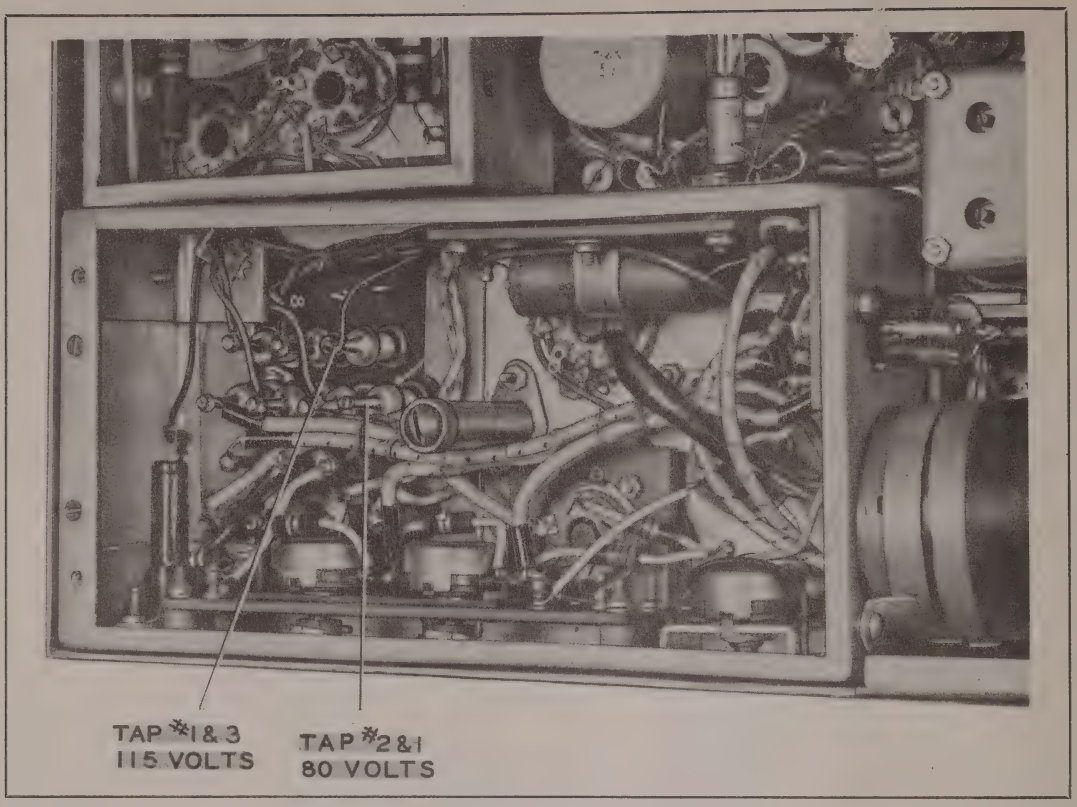


Figure 2-1. Power Transformer Taps

SECTION II

INSTALLATION AND ADJUSTMENT

1. UNPACKING EQUIPMENT.

Unpack the equipment carefully, check the components against the list given in section I. Make sure that all seven sub-assemblies are in place and that the pins connecting them to the main chassis are not damaged. Report any damage which is visually apparent to the officer in charge.

2. PRE-INSTALLATION TEST.

a. TO ADJUST FOR PROPER OPERATING VOLTAGE.

(1) Remove Indicator ID-60/APA-10 from its case.

(2) Remove dust cover from chassis No. 5.

(3) Set transformer tap to correspond to the input voltage. (Use tap numbers 1 and 2 for 80-volt source; tap numbers 1 and 3 for 115-volt source.) (See fig. 2-1.)

(4) Replace cover of chassis No. 5.

b. TUBE INSPECTION.

(1) Inspect all tubes for visible defects. Make sure they are firmly seated in their sockets.

(2) Replace cover of Indicator ID-60/APA-10.

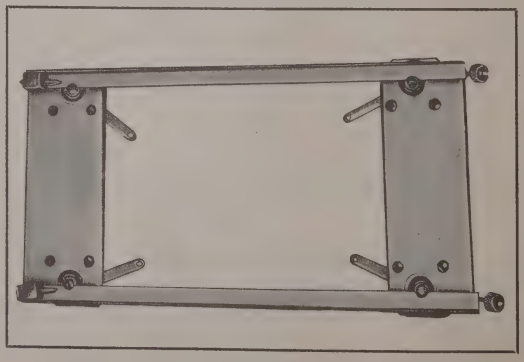


Figure 2-2. Mounting Base MT-171/U

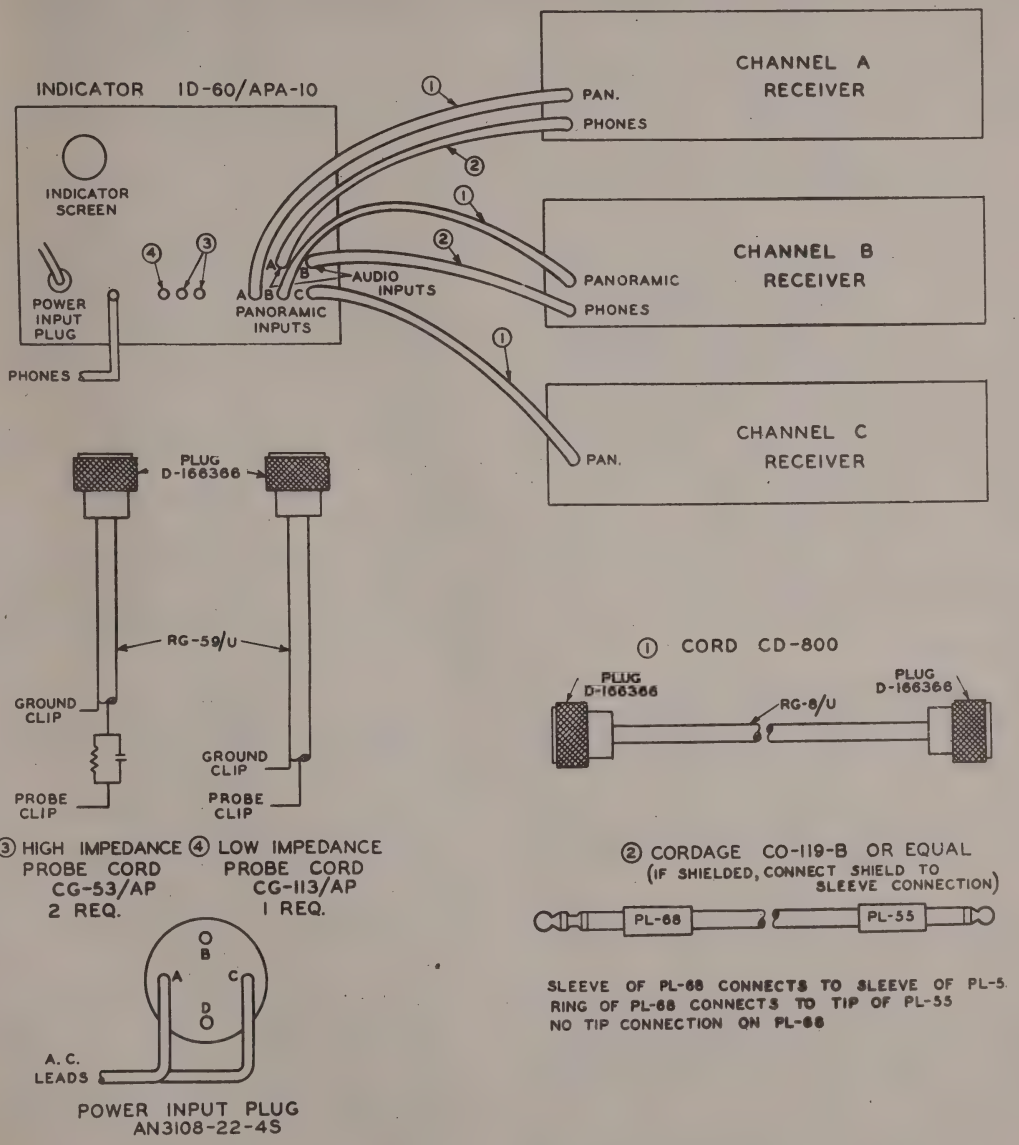


Figure 2-3. Cable Connections

3. INSTALLATION.

a. Mount Panoramic Adapter AN/APA-10 on a standard Mounting Base MT-171/U and safety wire. (See fig. 2-2.) The holes for mounting are drilled as shown in figure 8-1. Mount the unit so that the ventilating louvres on this unit and associated receivers are not obstructed, and so panel controls are accessible. The knurled locking nuts on the mounting base will be towards the front of the unit. If the unit is mounted so that a ground is not obtained through the shock-mount grounding strip, a ground lead must be provided.

b. Determine the distance between Panoramic Adapter AN/APA-10 and the associated receivers by the lengths of Cord CD-800.

c. Connect Panoramic Adapter AN/APA-10 to associated receivers as shown in figure 2-3. Connect the r-f input jacks on the unit (marked "PANORAMIC INPUTS") to the receiver outputs market "PAN." Notice that a 30-inch cord is used for channel A, and 20-inch cords are used for B and C channels. The right angle adapter, Adapter M-359, is used on these cords. Connect audio outputs (the jacks marked "PHONES") of receivers for A and B channels to the indicator panel jacks marked "AUDIO INPUTS" using the cords shown in figure 2-4. Plug a headset equipped with a Plug PL-55 into the "PHONES" jack of Indicator ID-60/APA-10.

d. Connect the power cable to Indicator ID-60/APA-10 panel socket by means of Plug AN3108-22-4S and Adapter AN3057-12.

4. CABLING.

a. The audio cords are made up of Cordage CO-119-B cut to proper length (they extend from the receiver to the Indicator ID-60/APA-10), and with Plug PL-55 connected to one end and Plug PL-68 connected to the other.

b. The r-f cords (Cord CD-800) consist of a length of Radio Frequency Cable RG-8/U fitted at both ends with Plug D-166366.

c. The power cable (see fig. 2-4) is cut to proper length and fitted with Adapter AN3057-12 and Plug AN3108-22-4S on one end.

d. One High Impedance CRO Probe Cord (Cord CG-53/AP) is supplied. This cord is 30 inches long and consists of Radio Frequency Cable RG-59/U fitted at one end with Plug D-166366, and at the other with a ground clip or a probe clip. The probe clip contains the resistor and capacitor.

e. One Low Impedance Sync Probe Cord (Cord CG-113/AP) is supplied. This is the same as the high impedance cord except that the resistor and capacitor are omitted.

f. One High Impedance CRO Probe Cord (Cord CG-180/AP) is supplied for horizontal deflecting plates.

Note

Generally the High Impedance CRO Probe Cord (Cord CG-53/AP) is used in the vertical input jack, but for certain applications of the CRO channel requiring high sensitivity (such as measuring hum voltages) the Low Impedance Sync Probe Cord (Cord CG-113/AP) may be used for a vertical deflection probe. Also the High Impedance CRO Probe Cord can be used for synchronizing in applications where it is desirable to avoid loading the source of synchronizing voltage.

5. ADJUSTMENTS.

Note

If, after installation, proper results are not obtained in one or more channels, it is advisable to check the i-f frequency and the i-f alignment of the receiver in the doubtful channel. The instruction book furnished with the receiver will give alignment procedure in case this is necessary.

a. GENERAL.

(1) Make certain all cables and cords are connected properly. (See fig. 2-3.)

(2) Turn on the associated equipment, the inverters and the receivers.

(3) Turn the "ON-OFF" switch on Indicator ID-60/APA-10 to "ON" position. If the pilot lamp on Indicator ID-60/APA-10 does not appear to light, rotate the lamp bezel from zero to maximum counter-clockwise position until it glows with the intensity desired.

Note

This equipment is aligned and adjusted before shipment from the factory. Make the following adjustments only if necessary.

b. CHANNEL A.—(All controls reference numbers apply to figs. 2-5, 2-6, 2-7 and 1-2.)

(1) Turn the "CHANNEL SELECTOR" switch (8) located on the panel of the indicator to A position. A trace should appear on the screen within 30 seconds and should fall about ¾ inches below the center.

Note

If the trace does not fall ¾ inches below the center for channels A and B, turn "CHANNEL SELECTOR" switch to CRO and center the spot. Then turn the switch back to channels A or B and adjust R-326 (the "BEAM DEPRESSION" control on Output chassis) until the trace is in proper position.

(2) With a screw driver the "HOR. GAIN" control (22) at minimum, adjust "HOR. CENT." (17) until spot is at center of screen. Then increase the "HOR. GAIN" (22) until the trace extends to the visible limits of the screen.

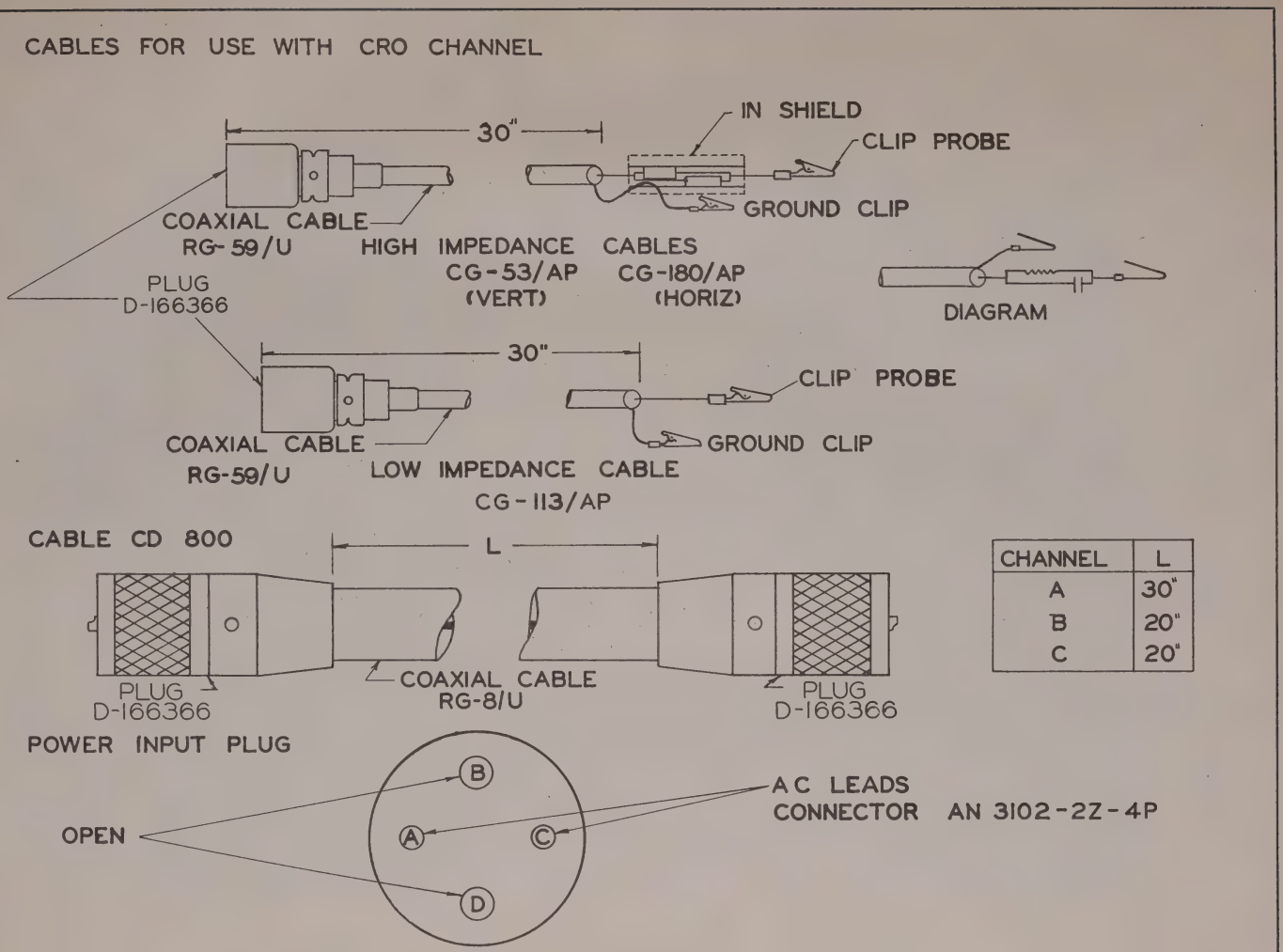


Figure 2-4. Construction of Cords

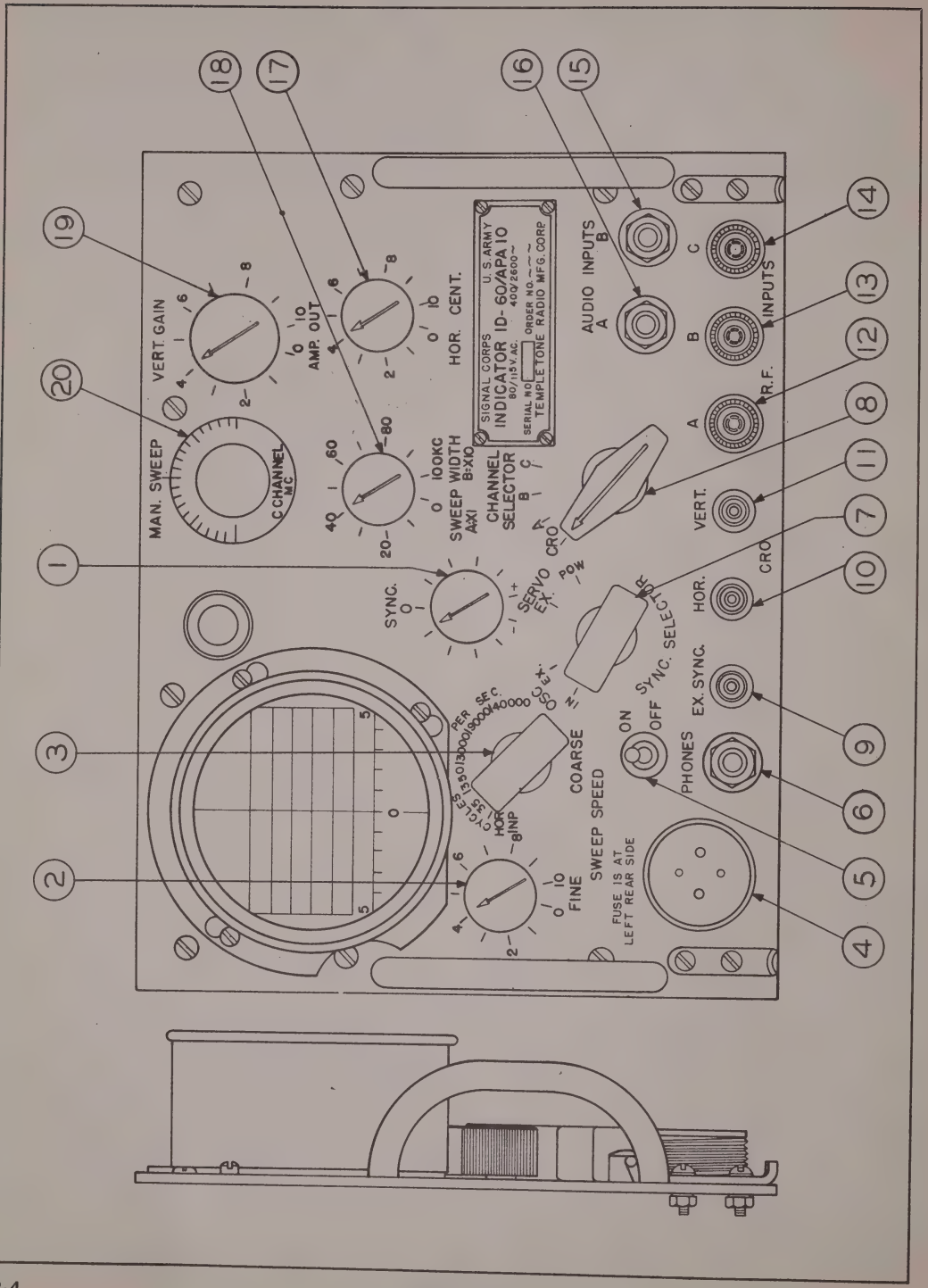


Figure 2-5. Panoramic Adapter AN/APA-10—Panel Controls

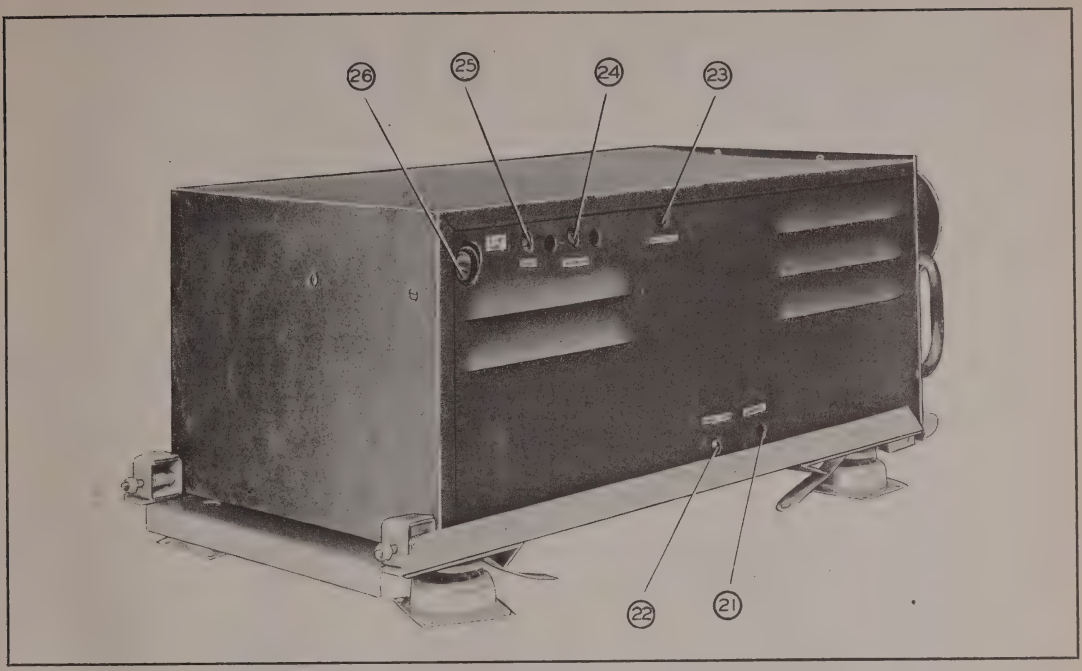


Figure 2-6. Indicator ID-60/APA-10—Left Side View

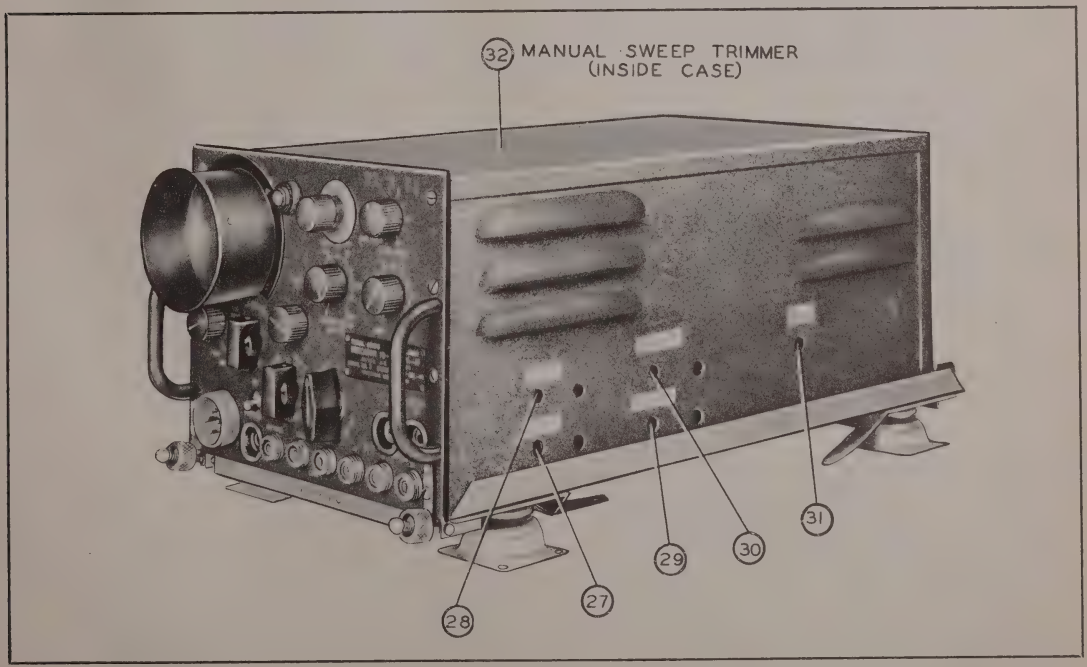


Figure 2-7. Indicator ID-60/APA-10—Right Side View

(3) With a screw driver adjust the "FOCUS" (25) control to attain a well defined line at both ends of the trace. To adjust "AUX. FOCUS" (23), switch to CRO position of "CHANNEL SELECTOR" switch. Touch the vertical input terminals until there is a stray pick-up signal of some frequency. Adjust "AUX. FOCUS" for clear image.

Note

The circuit design is such that when the "CHANNEL SELECTOR" switch is in the A and B positions, sweep operation is automatic and independent of controls except that the "EXTERNAL SWEEP" should not be in the "EXT" or "HOR" position. The sweep controls are operative for the C channel and for CRO observation, except that no "Servo" is provided for C channel.

(4) Turn "VERT. GAIN" (19) and "SWEEP WIDTH" (18) controls on the panel to maximum.

(5) Advance the A channel "SENSITIVITY" control (28) on the indicator with a screwdriver until a series of small bobbing peaks ("grass") appear on the baseline. Adjust, the "SENSITIVITY" control until these peaks are about 1/4-inch in height.

(6) Tune Radio Receiving Set AN/ARR-7 (used for channel A) to any available signal until it is heard in the headset connected to the indicator. The signal will be approximately centered on the screen by tuning the receiver. For exact centering, turn the "HOR. CENT." control (17) until the signal peak is on the center line. Adjust the "VERT. GAIN" (19) for satisfactory signal size.

(7) Tune the receiver for channel A, 50 kilocycles below the frequency of the centered signal. The peak should shift to the extreme right-hand mark on the screen.

(8) Tune this receiver 50 kilocycles above the frequency of the signal. This should shift the peak to the extreme left hand mark on the screen.

Note

If the signal shifts to the left instead of the right as the receiver is tuned lower, the *image* is seen on the screen rather than the real signal. While the sweep width can be adjusted satisfactorily using the image, it should be borne in mind that the direction of shift will be opposite to that taken by the true signal, and when the image is centered, the receiver is 910 kilocycles away from the true signal (on Channel A). An exception to this rule will be found on the two high frequency bands of Radio Receiving Set AN/ARR-5. On these bands the true signal will shift to the left as the receiver is tuned lower and to the right as the receiver is tuned higher. (For explanation see sec. IV.)

Direction of Receiver Tuning	*True Signal Moves*	*Image Moves*
Lower	Left to Right	Right to Left
Higher	Right to Left	Left to Right
For the two high frequency bands of Radio Receiving Set AN/ARR-5		
Lower	Right to Left	Left to Right
Higher	Left to Right	Right to Left

(9) If the sweep width is found incorrect in steps (7) and (8) above, the calibration can be brought in line by adjustment of "A DEVIATION LIMIT" control. This control (29) is a screwdriver adjustment.

c. CHANNEL B.

(1) Turn the "CHANNEL SELECTOR" switch on the indicator to B position. The trace will fall about 3/4 inch below the center of the screen. Repetition rate of the trace is constant and independent of the sweep control as for channel A.

(2) Turn "VERT. GAIN" (19) and "SWEEP WIDTH" (18) controls to maximum.

Note

Channel B is provided with a fixed sensitivity; there is no variable sensitivity control provided.

(3) Tune Radio Receiving Set AN/ARR-5 used for channel B to any available signal until it is heard in the headset.

(4) Center the signal by means of "HOR. CENT." control (17).

(5) Adjust "VERT. GAIN" (19) for satisfactory signal size.

(6) Tune the B-channel receiver 500 kilocycles below the frequency of the centered signal, and then 500 kilocycles above this signal. This should shift the peak to the extreme right mark and then to the extreme left mark on the screen. If the deviation is found to be incorrect, adjust the "DEVIATION LIMIT" control (30) for this channel.

d. CHANNEL C.

(1) Turn the "CHANNEL SELECTOR" switch to "C" position. The trace will be found along the horizontal center line of the screen.

(2) Advance the "VERT. GAIN" control to maximum. The "SWEEP WIDTH" (18) control is now inoperative and the "MAN SWEEP" (20) must be used to obtain a manual sweep of plus or minus one megacycle. If the receiver (Radio Receiving Equipment AN/APR-1, AN/APR-4 or Radio Set SCR-587-A) is tuned one megacycle off, the original pattern should be

brought back on the screen by turning the "MAN SWEEP" control (20) from its zero setting to the plus or minus one position.

(3) If the received signal cannot be brought back on the screen of the indicator at the plus or minus one setting of the "MAN SWEEP" control, tune the receiver to within either plus or minus one megacycle of the original signal.

(4) Set the "MAN. SWEEP" control (20) to either plus or minus one megacycle, the opposite to the frequency setting used in (3) above.

(5) Adjust the "MAN. SWEEP TRIMMER" (32) slightly by means of a screw driver to bring the signal on the screen at the proper point.

(6) In channel C, the "COARSE" (3) and "FINE" (2) controls, as well as "SYNC" (1) are operative. "VERT. GAIN" (19) and "HOR. CENT." (17) controls likewise aid in analysis of the pattern on the screen.

e. CHANNEL CRO.

(1) Turn "CHANNEL SELECTOR" switch to CRO position. The trace will be centered on the screen.

(2) Input jacks are provided for "HORIZONTAL INPUT" (10) and "VERT. INPUT" (11) and "EXT. SYNC" (9).

(3) The "SYNC SELECTOR" switch (7) offers a selection of internal or external synchronization, and a Servo circuit provides a triggered, non-oscillatory sweep.

(4) The "VERT. GAIN" control in the "AMP. OUT" position provides direct connection to the vertical deflection plates.

SECTION III
OPERATION

1. TO START PANORAMIC ADAPTER AN/APA-10.

a. Make certain that all cable connections are tight.

b. Turn on the associated receiver.

c. Turn "CHANNEL SELECTOR" switch to the channel corresponding to the receiver used.

d. Turn the "ON-OFF" switch on Indicator ID-60/APA-10 to "ON" position.

e. Tune receiver until a signal tone is heard in the headphone. This signal peak will appear on the screen of the cathode ray tube.

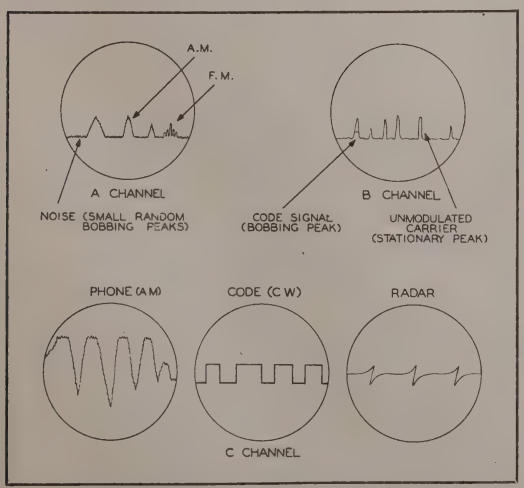


Figure 3-1. Signal Pips on Screen

f. Adjust "VERT. GAIN" control for satisfactory signal size.

g. Center the peak by tuning the receiver to the exact signal frequency.

(1) The frequency of this signal may now be read from the receiver dial.

(2) Every peak to the right of the centered signal will represent r-f frequencies above that of the signal. (See note below for exception.)

(3) Every peak to the left of the centered signal will represent r-f frequencies below that of the signal. (See note below for exception.)

Note

The above statements are valid for the *true signal* only. There is also the possibility of seeing *images* on the screen. The image, if centered will be 910 kilocycles away from the true signal frequency on Channel A. To differentiate between the true signal and the image, the following rule applies: If the receiver is tuned lower in frequency, the true signal peak moves to the right; the image moves to the left. If the receiver is tuned higher the true signal moves to the left; the image moves to the right. An exception to this rule and to (2) and (3) of subparagraph *g.* above will be found in the two high frequency bands of the B-channel receiver, Radio Receiving Set AN/ARR-5. Here, the signal peak moves to the left as the frequency of the receiver is lowered, and moves to the right as the receiver frequency is raised. The image does the opposite.

b. The shape of the peak will disclose the nature of the signal (amplitude modulated, coded, etc.). (See fig. 3-1.)

i. Compare the size of the peaks for an indication of relative signal strength.

j. To examine some particular peak and to eliminate the others, center the peak and turn the "SWEEP WIDTH" control to a minimum. This will progressively eliminate those peaks away from center.

Note

As "SWEEP WIDTH" control is turned toward minimum, the band of frequencies covered by the sweep is reduced but the actual sweep width across the screen remains the same. The signal peaks farthest away from center are progessively eliminated. The sweep width in kilocycles can be read directly from calibrated dial in channel A position, and for B channel can be multiplied by ten.

k. Turn "CHANNEL SELECTOR" switch to C position to observe the modulation envelope (oscillographic presentation).

2. TO STOP PANORAMIC ADAPTER AN/APA-10.

a. Turn "ON-OFF" switch on Indicator ID-60/APA-10 to "OFF" position.

b. Turn off the associated receivers.

SECTION IV
THEORY OF OPERATION

1. GENERAL.

a. Panoramic Adapter AN/APA-10 is an equipment which is used with certain receivers to picture on the screen of a cathode ray tube a portion of the radio spectrum. *(See fig. 4-1.)*

b. The panoramic input of the adapter is taken from the i-f section of the associated receiver. An oscillator within the adapter beats against this input frequency and another intermediate frequency is produced; this is the i-f frequency of the adapter and is 3.9 megacycles for A, B, and C channels.

c. The oscillator within the adapter is modulated by a reactance tube in synchronism with the sawtooth sweep voltage of the cathode ray tube. Thus the frequency of

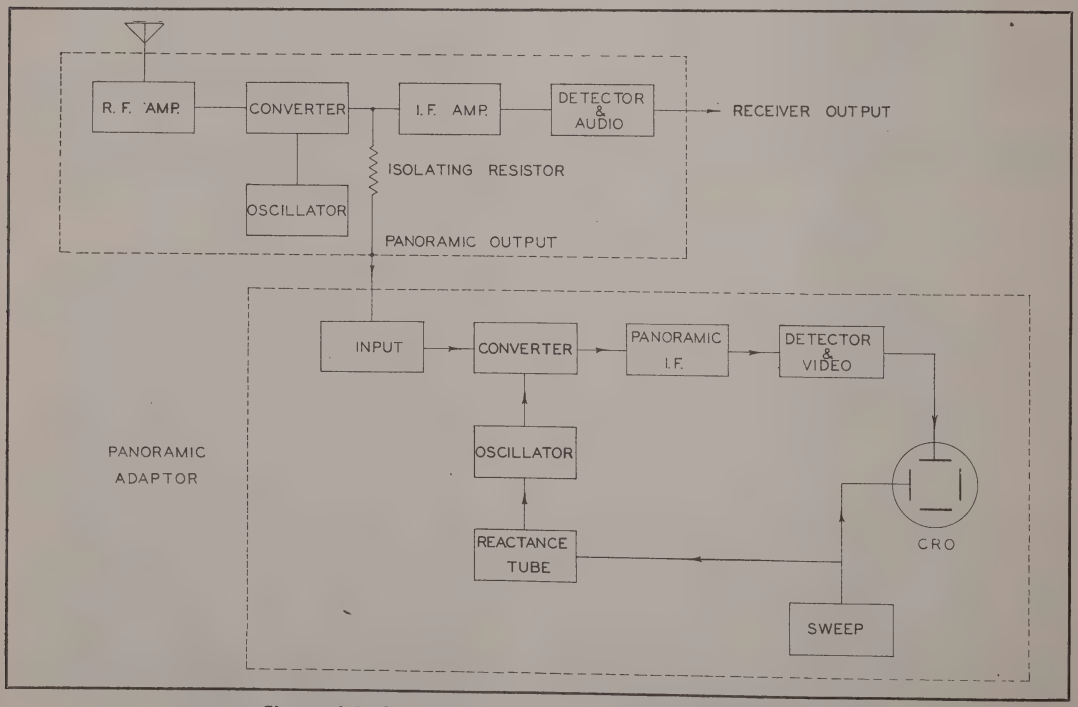


Figure 4-1. Simplified Diagram of Operation Sequence

the oscillator increases as the sweep progresses across the screen; the low frequencies will appear at the start of the sweep and the high frequencies will appear at the end of the sweep.

d. The screen, then, becomes a panorama or parade of frequencies within a certain band. Any signals present within this band are applied to the vertical deflection plates of the cathode ray tube to give a signal peak on the screen.

e. The size of the signal peak is an indication of relative signal strength; the shape is indicative of the type of modulation. The frequency of the signal may be determined by tuning the receiver until the peak is centered on the screen. The receiver dial reading gives the frequency of the centered signal.

f. If the oscillator were disconnected from the reactance tube, frequency modulation would not take place and a constant output of 3.9 megacycles would be obtained. This happens when the "CHANNEL SELECTOR" switch is turned to channel C. The 3.9-megacycle signal is amplified, rectified, and amplified again to drive the vertical deflection plates of the cathode ray tube.

g. A blanking pulse eliminates the return trace from the screen of the cathode ray tube.

h. The audio output of the receivers used for channels A and B is fed into the jacks marked "AUDIO INPUTS". These jacks are capacitively coupled to the grid of a cathode follower (V-801) in chassis No. 8. The output from the cathode goes to the "PHONES" jack. For channel C, there is no audio input from the associated receiver. Instead, the signal is detected within the adapter and fed to the grid of the cathode follower in chassis No. 8.

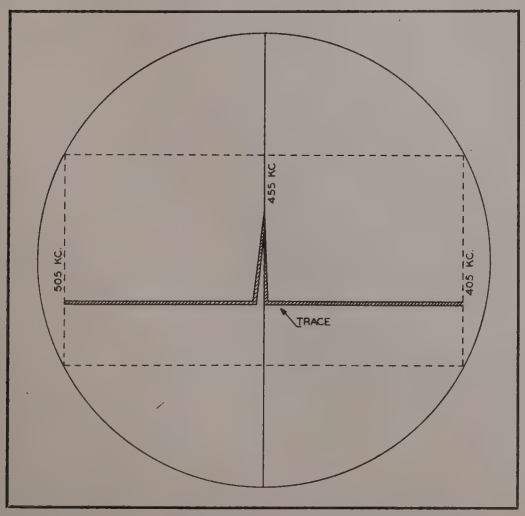


Figure 4-2. Diagram of Adapter Screen

2. IMAGE DETECTION.

a. The receivers used with Panoramic Adapter AN/APA-10 are of the super-heterodyne type and the danger of image reception is ever present. Conventionally a receiver oscillator beats above the signal and the i-f frequency represents the difference between the receiver oscillator frequency and the signal frequency. If the receiver is tuned through the signal the oscillator now begins to beat below the signal frequency. When a point is reached below the signal where the difference is again equal to the i-f frequency an *image* is received.

b. Refer to figure 4-2. The adapter scans a band of frequencies 100 kilocycles wide for channel A. The lowest frequency visible on the screen will be 405 kilocycles. (The r-f frequency from which it was converted depends on the setting of the receiver tuning dial.) The highest frequency visible will be 505 kilocycles. The center frequency will be 455 kilocycles and will be the signal to which the receiver is fully tuned.

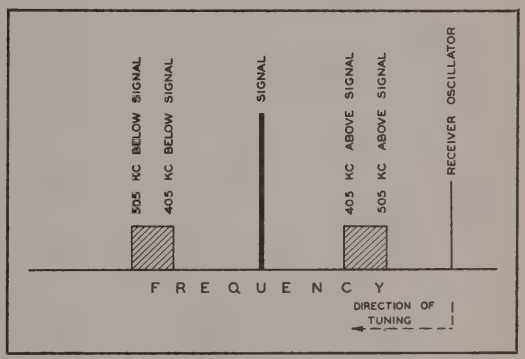


Figure 4-3. Diagram of Frequency Spectrum and Image

c. Now refer to figure 4-3. If the receiver oscillator is tuned from high to low frequencies, and if but one signal is present, there will be a point 505 kilocycles above the signal which will be reached first. This peak will appear on the left hand side of the adapter screen. *(See fig. 4-2.)* If the receiver frequency is lowered, the signal will move across the screen to center, then will disappear at the right-hand edge of the screen.

d. If the receiver oscillator is tuned still lower it will pass through the signal frequency and will beat on the other side. At a point 405 kilocycles below the signal, the peak will become visible on the adapter screen on the right-hand edge; this peak will move across the screen from right to left as the receiver frequency is lowered.

e. Thus, the image peak travels across the screen from right to left and the true signal travels across the screen from left to right as the receiver oscillator frequency is progressively reduced when the oscillator is designed to beat above the signal. An operator should use only the true signal peak in determining frequencies of signals.

f. An exception to the above will be found on the two high frequency bands of Radio Receiving Set AN/ARR-5, used on B channel. For these two bands the receiver oscillator is designed to beat below the signal so the true signal peak will move from right to left as the receiver is tuned lower and from left to right as the receiver is tuned higher. The image for these two bands will move to the right as the receiver is tuned lower and to the left as the receiver is tuned higher.

g. Whereas in conventional super-heterodyne receivers the r-f section is tuned to pre-select the signal and to reject the image by narrowing the pass-band of the r-f stages, the receivers used with Panoramic Adapted AN/APA-10 must pass a wide band for the adapter to scan. Some images get through and will appear on the screen.

3. MECHANICAL CHARACTERISTICS.

a. Panoramic Adapter AN/APA-10 uses seven plug-in chassis, protected by removable dust covers, and a main chassis which is housed in a case (SARC B1-D). Electrical connections are made through strips of banana pin jacks, and each small chassis is held in place by captive screws. Machine screws assist in securing the power and filter chassis.

b. Replacement of chassis 1, 2, or 3 requires the removal of the shaft of the "CHANNEL SELECTOR" switch after loosening one Allen setscrew on the grounding collar inside chassis 1.

c. Chassis 4, 5, and 6 may be removed by loosening the captive screws without removing the switch shaft. Chassis 5 has a central bolting pillar. Before removing chassis 4, chassis 7 and the tube clamp and tubes on chassis 4 must be removed.

d. The cathode ray tube must be removed before removing chassis No. 5 (power). It is also desirable to remove the JAN-5R4GY rectifier tube before removing chassis No. 5.

e. The front panel is removable for access to sub-panel wiring and components after removing the knobs and retaining screws. *(See fig. 4-7.)*

WARNING

Voltages above 400 volts have been isolated in chassis No. 5. Potentials of 400 volts are present in other chassis. Use caution when working with this equipment.

4. ELECTRICAL CHARACTERISTICS.

a. CHASSIS No. 1.—The primary purpose of chassis No. 1 is to deliver sufficient driving voltage to converter chassis No. 2. *(See fig. 4-8 and 4-9.)*

Note

Unless otherwise specified, all parts reference numbers apply to figure 8-5.

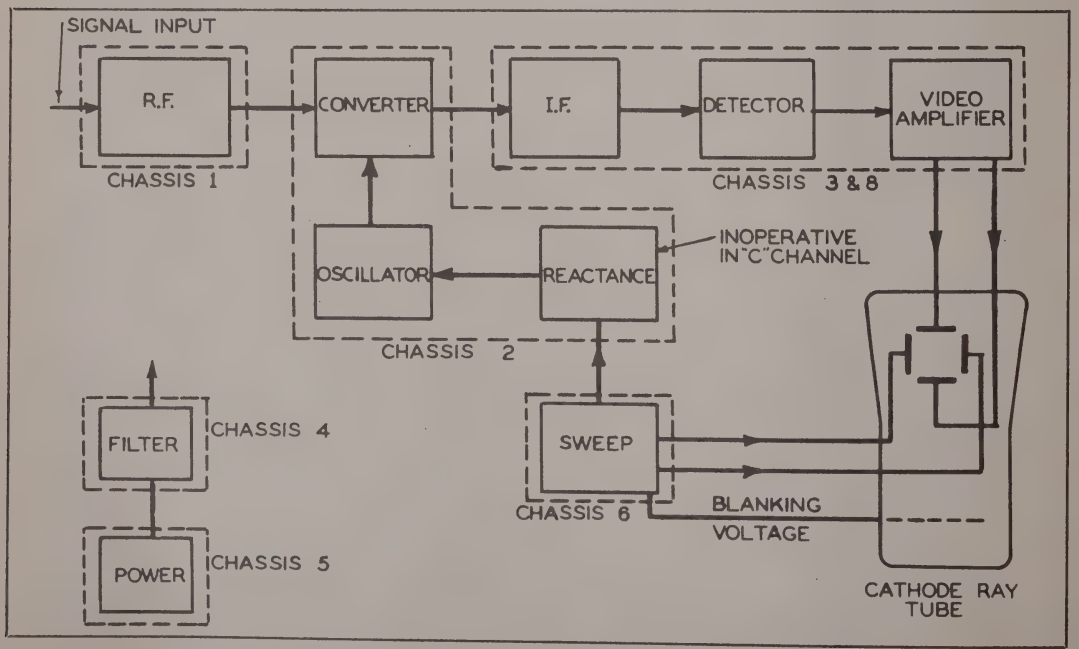


Figure 4-4. Block Diagram of Panoramic Adapter AN/APA-10

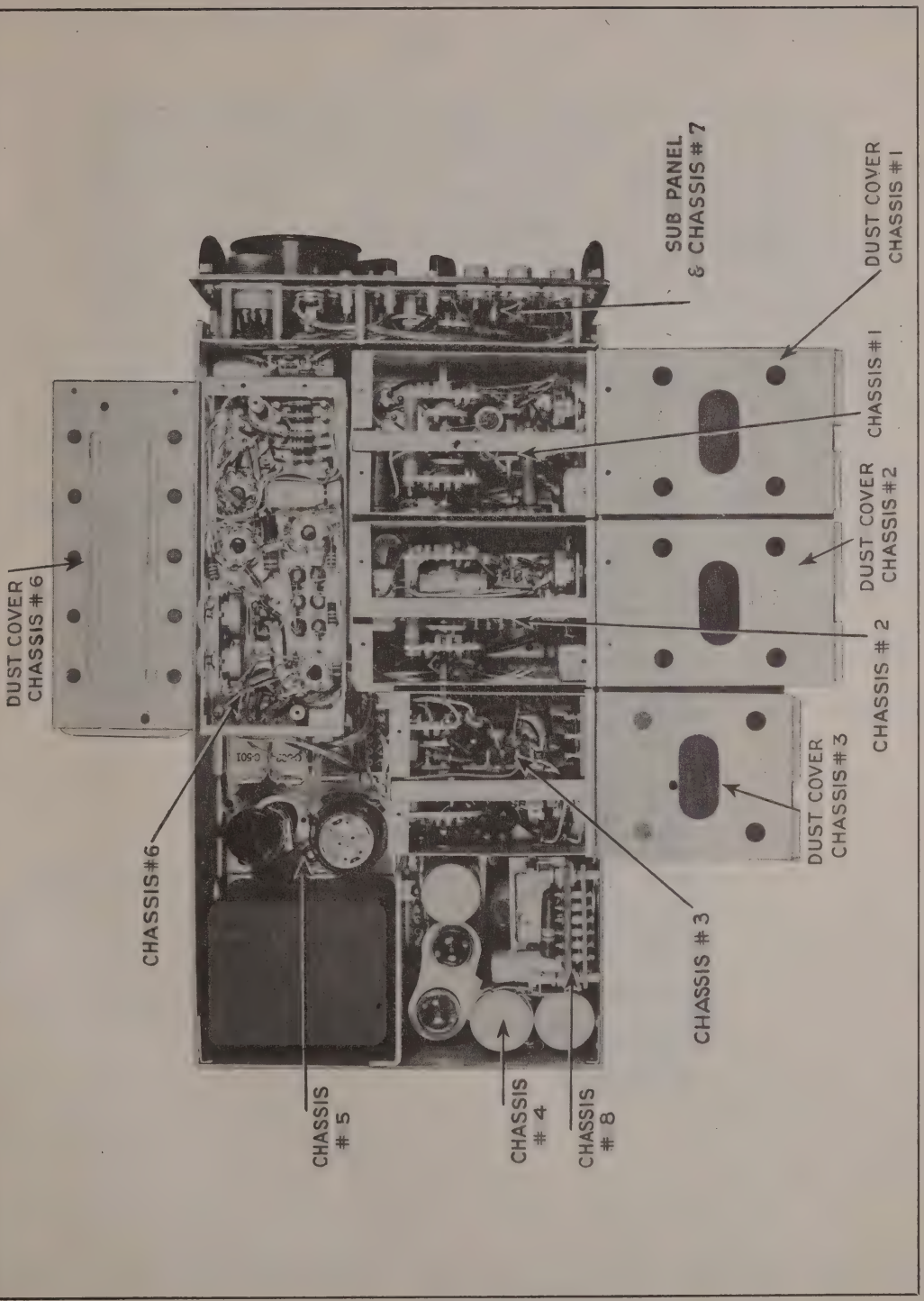


Figure 4-5. Panoramic Adapter AN/APA-10—Bottom View of Inferior

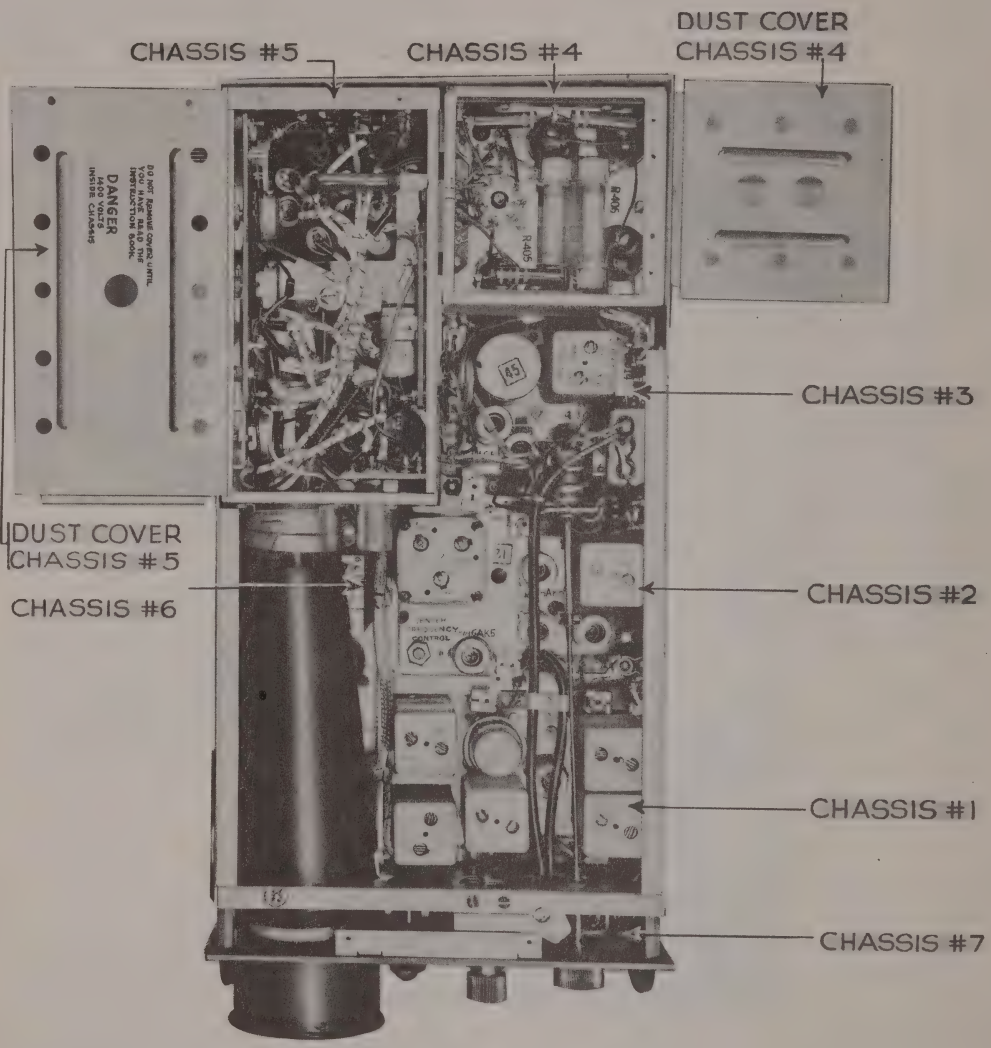


Figure 4-6. Panoramic Adapter AN/APA-10—Top View of Interior

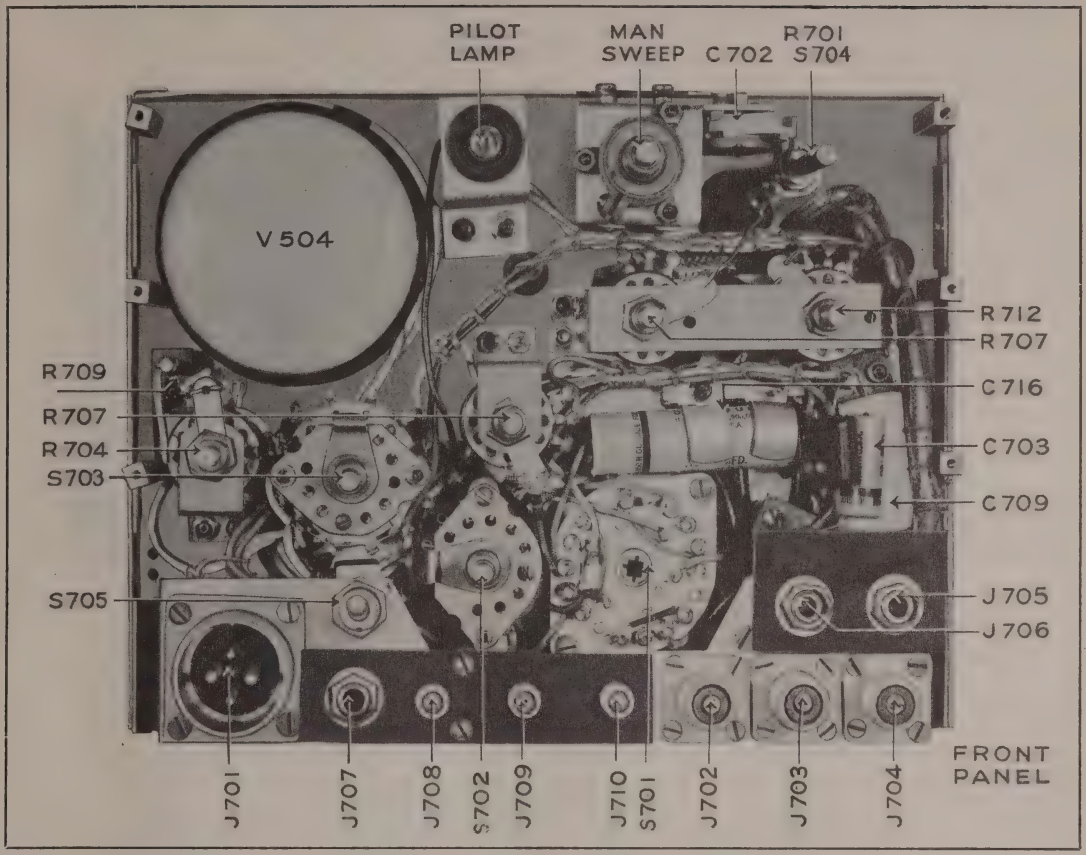


Figure 4-7. Panoramic Adapter AN/APA-10—Front Panel Sub-Assembly

(1) The amplitude of the input voltage must be about the same for all frequencies scanned. This equalization takes place in chassis No. 1. The band-pass transformers used with this chassis have characteristics which are the inverse of the characteristics of the companion receiver. The over-all response is approximately flat for all frequencies observed.

(2) Chassis No. 1 includes three input transformers; one for each channel A, B, and C. These channels correspond to the i-f frequencies of the associated receivers, 455 kilocycles, 5.25 megacycles, and 30 megacycles. Channels A and B have output transformers but channel C is resistance coupled to the next chassis. A JAN-6AK5 amplifier can be switched into the channel in use. Sensitivity controls with screwdriver adjustments are provided for channels A and C. Two switch wafers of three sections each provide switching facilities in the output chassis for the three channels. A voltage regulator tube, JAN-OD3/VR150 is included to furnish a regulated voltage to chassis 2.

(3) An r-f gain control *(see fig. 8-2, R-701A)* is provided to vary the basis on the JAN-6AK5 amplifier of this chassis. This gain control is ganged with the "VERT. GAIN" control on the panel and governs the height of the signal peak on the screen. Sensitivity controls R-106 and R-107 are in series with the r-f gain control.

b. CHASSIS No. 2—CONVERTER CHASSIS.

(1) This chassis includes a frequency modulated oscillator, a reactance tube, an isolating stage (cathode follower), and a converter tube. The oscillator has three tank circuits, one for each channel A, B, and C. *(See fig. 4-10.)* They are contained in one shield can (T-202). Another can (T-201) contains the i-f input transformer to chassis No. 3 and is located in the output of the converter tube. *(See fig. 4-13.)*

(2) A sawtooth voltage from the cathode ray tube sweep circuit is introduced into the cathode follower. The output of this cathode follower is fed to the screen

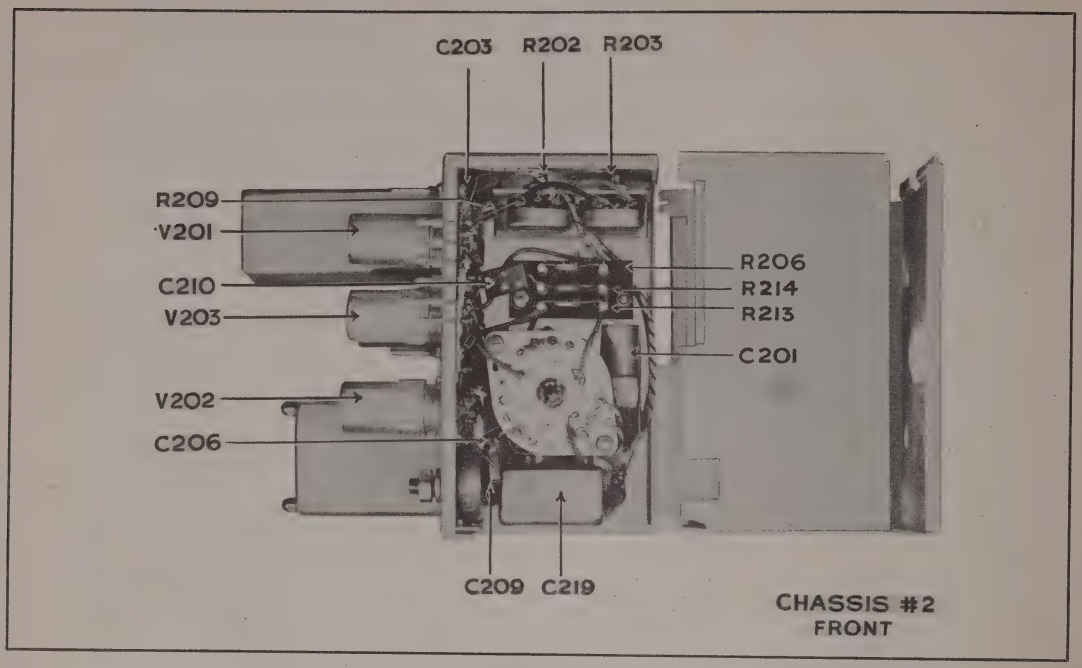


Figure 4-11. Chassis No. 2—Front View

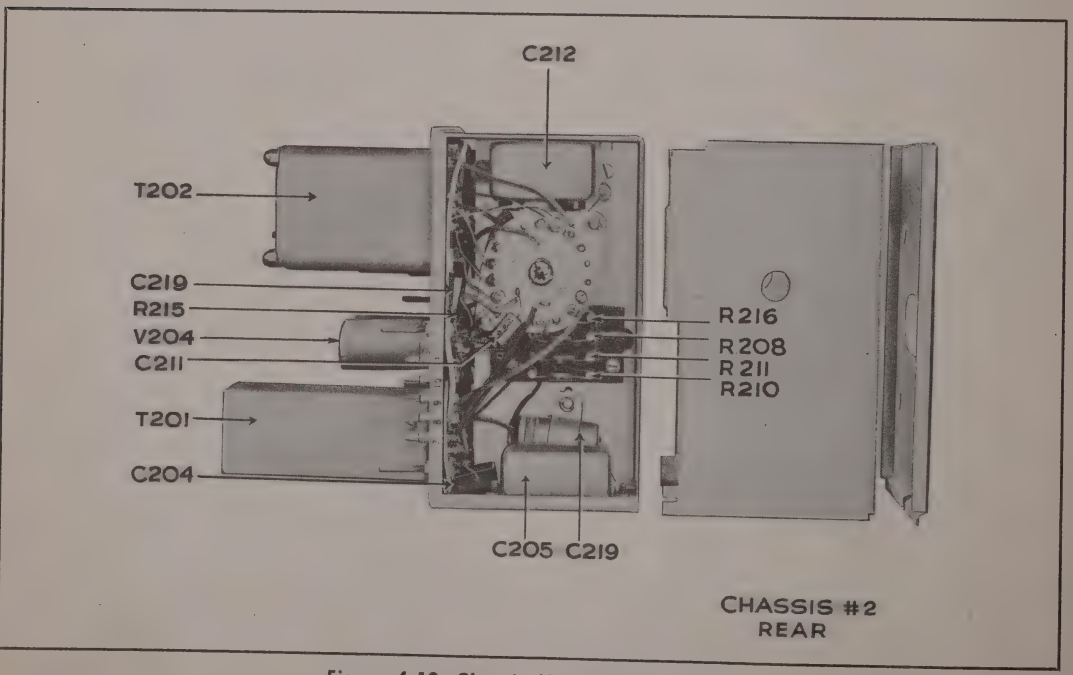


Figure 4-12. Chassis No. 2—Rear View

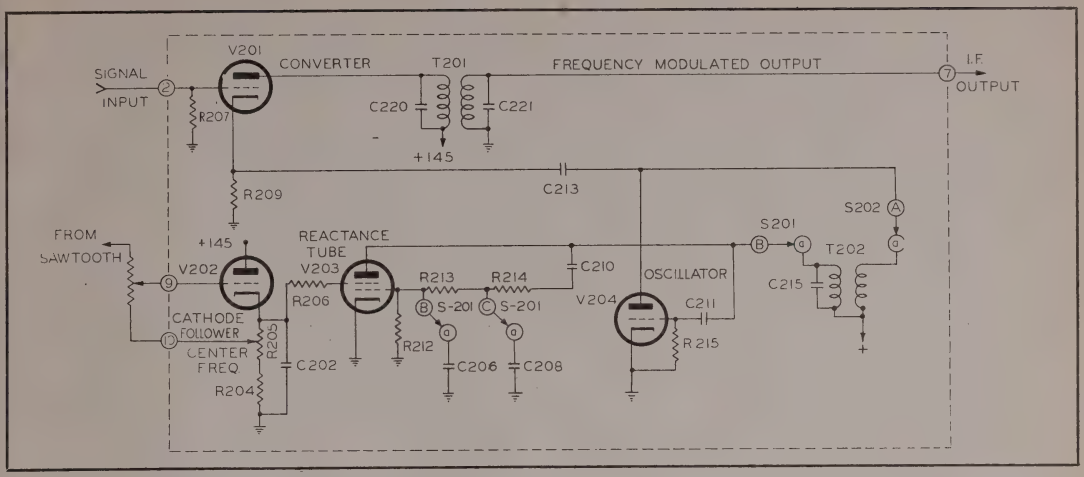


Figure 4-13. Simplified Conversion Network

of a reactance tube. In the reactance tube the grid circuit is fed from the plate circuit through a network (R-214, C-208 or C-207, R-213, C-206) which shifts the phase of the voltage between grid and plate by approximately 90 degrees. *(See fig. 4-14.)* If properly designed, the impedance of the plate circuit of such a tube is nearly a pure reactance, a reactance whose magnitude depends on the mutual conductance of the tube. (Mutual conductance is the ratio of a small change in plate current to the small change in grid voltage which produced it; the plate voltage is held constant.) It may be seen that the mutual conductance will be influenced by changing the grid or screen voltage of the tube. Hence the reactance may be varied by varying screen voltage. *(See fig. 4-15.)* If the reactance tube is shunted across a tuned oscillator circuit, the frequency of the oscillator may then be varied by varying the screen voltage of the reactance tube. This is the means provided in chassis No. 2 for modulating the oscillator. The reactance tube, in effect, is a variable electronic capacitor which changes the frequency in step with the sawtooth sweep voltage. *(See fig. 4-16.)*

(3) Two switch wafers of three sections each provide facilities for switching from one channel to another.

(4) The output of the converter has the i-f frequency of the adapter, 3.9 megacycles, as a center frequency.

(5) For channel C operation, the reactance tube is disconnected from the oscillator and the frequency of the oscillator is varied by manual tuning of a variable capacitor, the "MAN. SWEEP" control (C-701).

c. CHASSIS No. 3—OUTPUT CHASSIS.

(1) This chassis contains one stage of i-f amplification at 3.9 megacycles, a second detector, and a push-pull vertical deflection amplifier. *(See figs. 4-17, 4-18.)*

(2) V-301 is a conventional i-f amplifier which feeds V-302 through an i-f transformer, T-301. V-302 acts as an amplifier when used with channel CRO. In A, B, or C channels the tube is self-biased to the point where the average value of voltage developed across capacitor C-309 and resistor combination R-307 and R-308 follows the audio frequency modulation envelope. Detection is the result. In CRO position, only part of the cathode bias resistance is used and the tube operates Class A, a cathode follower.

(3) V-303 and V-304 act as push-pull amplifiers and feed the vertical deflection plates of the cathode ray tube. In early models of this equipment, the output of the push-pull amplifiers could be switched into the primary of an output transformer for channel C operation. This was the audio output for this channel and the secondary was connected to the "PHONES" jack. In present models, the output of the push-pull amplifiers, be-

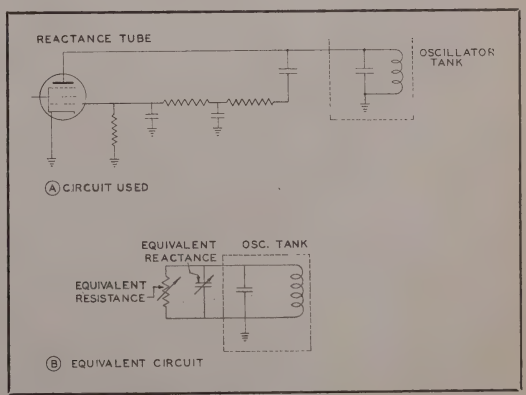


Figure 4-14. Reactance Tube and Network

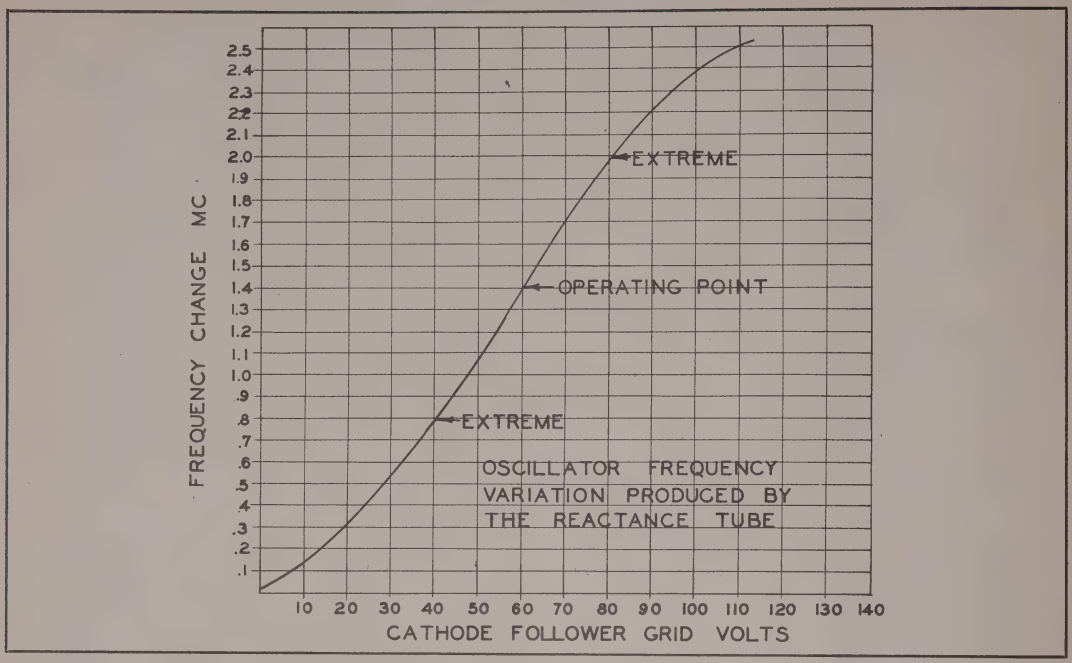


Figure 4-15. Frequency Deviation With Reactance Tube Bias

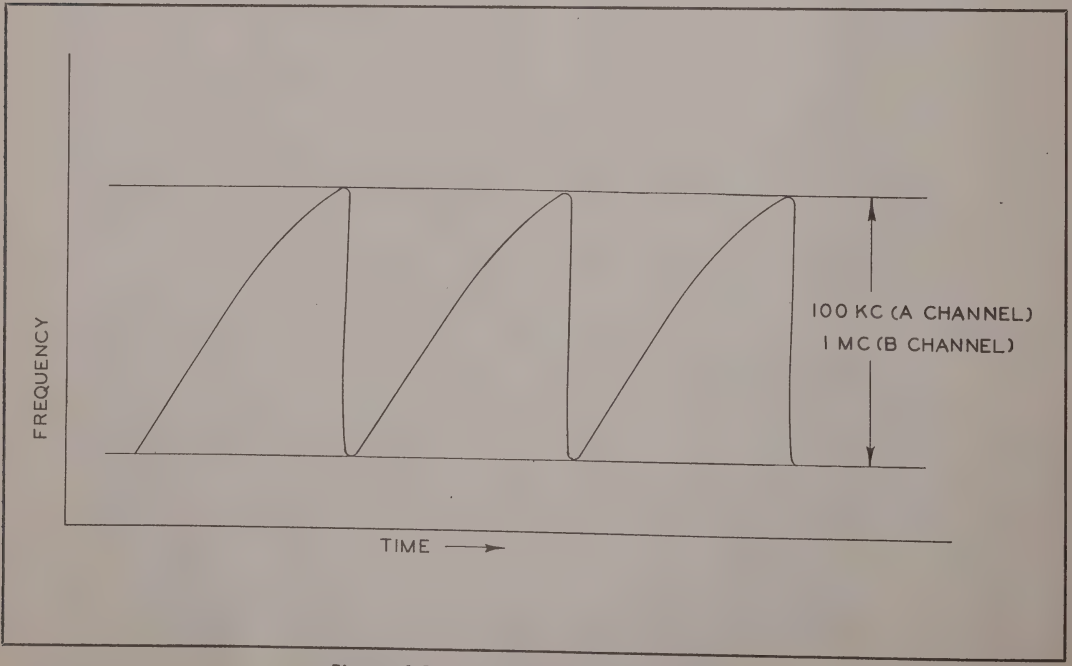


Figure 4-16. Oscillator Frequency Swing

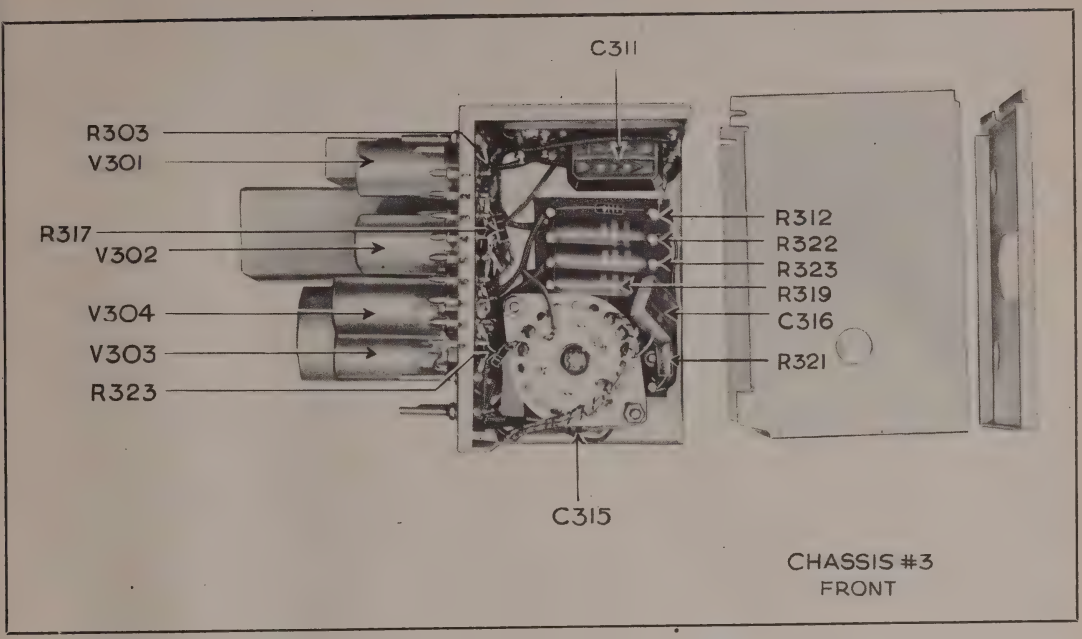


Figure 4-17. Chassis No. 3—Front View

Note: Not available at time of printing.

Figure 4-18. Chassis No. 3—Rear View

sides being applied to the vertical deflection plates, is also capacitively coupled to the grid of a cathode follower (V-801) in chassis No. 8. The bias applied to the push-pull amplifiers can be varied by the "VERT. CENT." control (R-324A and R-324B). The amount of signal voltage applied to the grids is controlled by the "VERT. GAIN" control (R-701B, which is ganged with the "R-F GAIN" R-701A). The "BEAM DEPRESSION" control (R-326) on late models, moves the base line up or down by causing one of the push-pull tubes to conduct more than the other one.

(4) The output i-f transformer T-301 is located in this chassis. Switching is provided by two switch wafers of three sections each.

(5) With the switches in channel C position, the pass-band of the i-f transformers T-301 and T-201 is widened to 50 kilocycles. In early models this was accomplished by switching into the transformer tuned circuits a .0047 microfarad capacitor which de-tuned the circuit enough to broaden the pass-band. Sometimes this additional capacitance resulted in oscillation in the i-f circuit and to correct this the present method was adopted. A winding is switched into the secondary of the transformers when the switch is in C position which increases coupling between primary and secondary and broadens the pass-band.

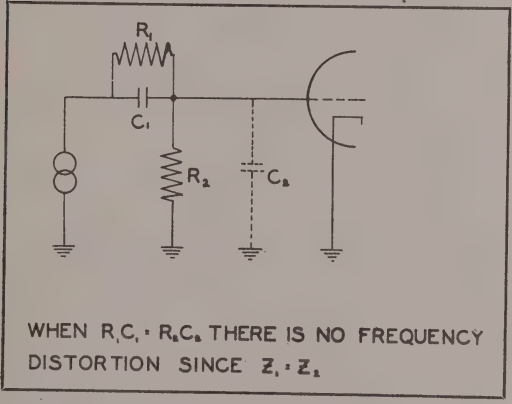


Figure 4-19. Frequency Equalizing Network

(6) The RC networks represented by R-317, C-312, R-314 and the grid-to-cathode capacitance of V-303 are a frequency equalizing network in order to obtain uniformity of response up to a high frequency. *(See fig. 4-19.)*

d. CHASSIS No. 4—This is the filter chassis. *(See figs. 4-20, 4-21.)*

(1) The low voltage filter uses two voltage regulator tubes, V-401 and V-402. These make available regulated positive 300 volts and 150 volts for critical circuits and an unregulated 400 volt supply.

(2) The L-C filtering is accomplished by the net-

Note: Not available at time of printing.

Figure 4-20. Chassis No. 4—Front View

Note: Not available at time of printing.

Figure 4-21. Chassis No. 4—Rear View

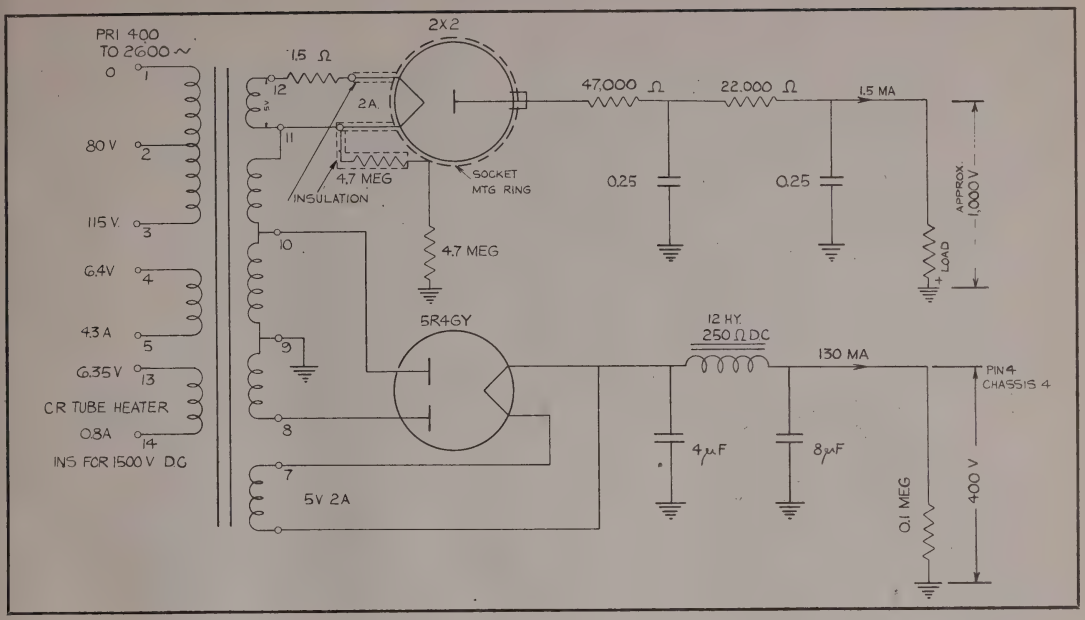


Figure 4-22. Power Supply Circuit Diagram

work L-401, C-401, C-402, and C-403. Resistor R-403 bleeds the filter for safety.

(3) Resistors R-401 and R-402 equalize the current through the voltage regulator tubes. Otherwise V-401 will overload.

e. CHASSIS No. 5—POWER CHASSIS.

WARNING

1200 volts appear at several points in this chassis.. Use extreme care in maintenance work to avoid possible injury!

(1) This chassis provides power conversion from 75 to 85 and from 105 to 125 ac., 400 to 2600 cycles, to 150 volts dc., 300 volts dc., 400 volts dc., 1200 volts dc., and 6.3 volts ac. A fused power transformer is provided (3-ampere, 250-volt fuse), one JAN-5R4GY and one JAN-2X2 rectifier tube, a resistance-capacitance filter, two focus controls, an intensity control, and a dc. re-inserter tube. *(See fig. 4-22.)* (Taps 1 and 2 on power transformer are used for 80 volts input, taps 1 and 3 for 110 volts input.)

(2) The cathode ray tube socket is mounted on this chassis as is the dc. re-inserter tube whose function is to keep the intensity of the beam (in the cathode ray tube) constant regardless of the character of the signal on the control grid of the cathode ray tube.

(3) The circuit for high and low voltage power supplies is shown in figure 4-22. It is noted that the 1200-volt supply has the positive side grounded for safety, leaving the cathode of the cathode ray tube at 1200 volts (—) with respect to ground.

(4) As the cathode ray tube draws little current an RC filter is provided for the high voltage rectifier. The rectifier is a half-wave, which is satisfactory for this purpose. *(See figs. 4-23, 4-24.)*

(5) The low voltage rectifier is a full-wave rectifier whose output is filtered and regulated in chassis 4.

(6) Two focus controls, R-508 and R-509, are provided. By working these together, a sharp focus may be obtained for all positions of the beam. These focus controls vary the potential applied to the first and second anodes.

(7) The dc. re-inserter, V-503, acts as a diode. The only reason a pentode is used is that several other JAN-6AK5 tubes are used in the circuit and this one may be employed as a spare. The dc. reinserter serves to maintain a constant beam intensity in the cathode ray tube regardless of the amplitude of the blanking voltage and the speed of the sweep. It may be seen that the blanking voltage is a square wave the amplitude of which is adjustable and dependent on sweep speed. Since this voltage is applied directly to the grid of the cathode ray tube, it increases the potential difference between the grid and cathode, and thus increases the beam intensity, in direct proportion to the amplitude of the blanking voltage. When the dc. reinserter is placed in the circuit, the positive portion of the square wave causes V-503 to conduct; electrons flow from cathode to grid and through resistor R-510 back to the cathode. This flow is in such a direction that the grid end of resistor

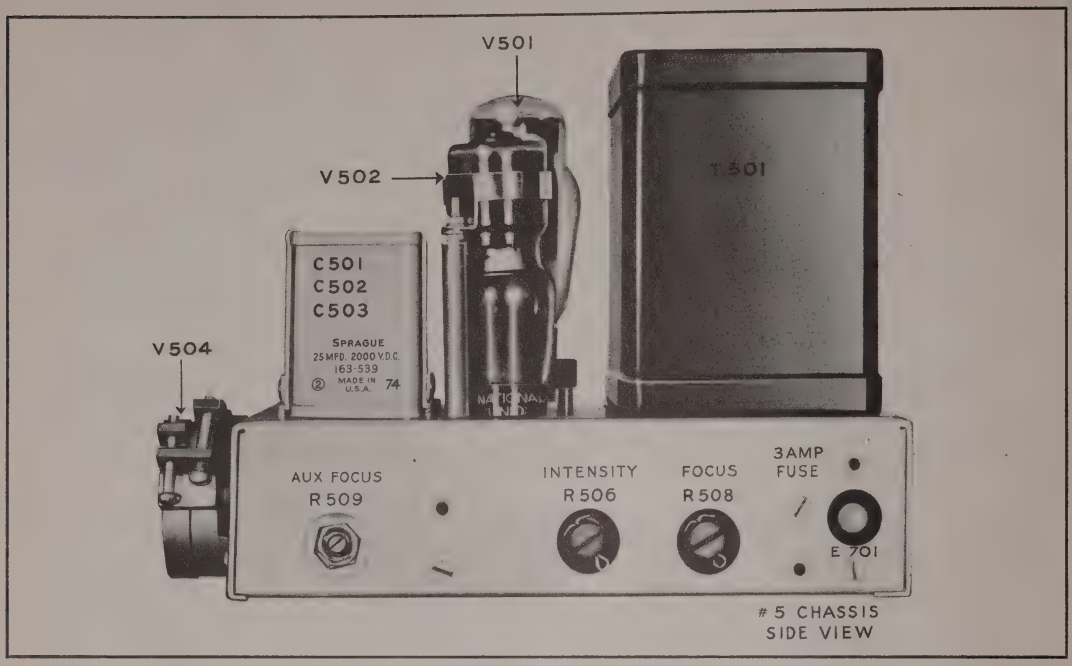


Figure 4-23. Chassis No. 5—Side View

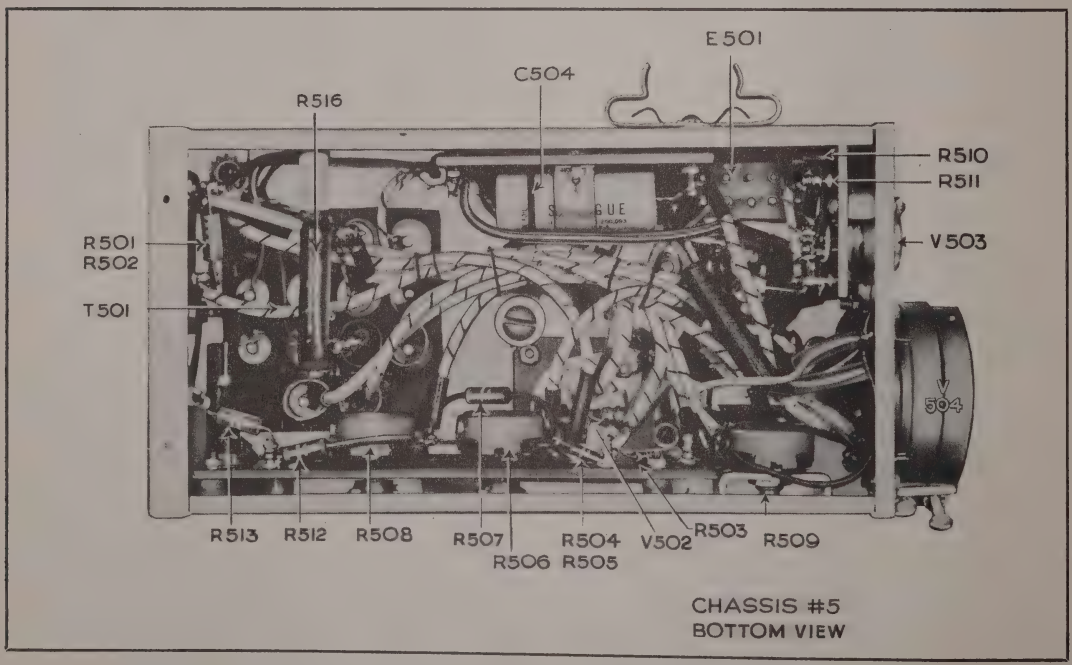


Figure 4-24. Chassis No. 5—Bottom View

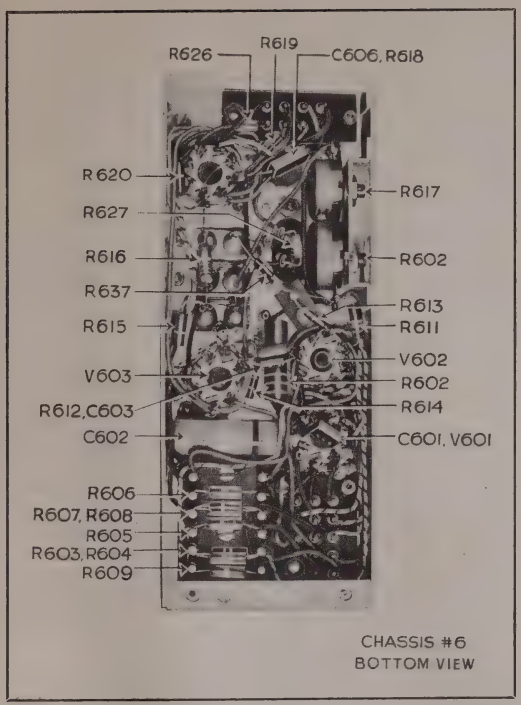


Figure 4-25. Chassis No. 6—Bottom View

R-510 becomes negative by an amount which neutralizes the positive half cycle of the square wave. The greater the ac. amplitude of the square wave, the greater the flow through the dc. re-inserter, and the greater the neutralizing voltage. The grid of the cathode ray tube then is held at a potential which is virtually independent of the amplitude of the square wave blanking and sweep speed for the duration of the positive half cycle. During the negative half cycle, V-503 does not conduct and the full negative voltage is applied to the grid of the cathode ray tube. Thus, the blanking voltage can be adjusted to become more negative, depending on the setting of the control, R-602; but the grid of the cathode ray tube will not become more positive because of this setting. The beam within the cathode ray tube will be uniform in intensity for any amount of blanking voltage.

(8) The heater circuit for all tubes except the cathode ray tube is about 150 volts above ground. This is due to the fact that the cathode of the sawtooth generator tube (V-603) is at times nearly 200 volts above ground, and by raising the potentials of the heaters above ground, the danger of arc over from the heating element is lessened. The heaters operate from a 6.4-volt ac. winding of the power transformer, T-501. The cathode ray tube has its own heater winding on this transformer.

f. CHASSIS No. 6—SWEEP CHASSIS.

(1) The sweep chassis provides a circuit capable of forming sawtooth waveforms with rates from 35 to 40,000 cycles per second. *(See figs. 4-25 and 4-26.)* A square wave is first generated by a multivibrator which excites a pulse shaper tube. The sawtooth is formed in the cathode circuit of the pulse shaper. *(See figs. 4-27 and 4-28.)* This tube normally conducts and is cut off by the multivibrator, whereupon the RC circuit yields approximately sawtooth waveforms.

(2) The servo position of the switch requires a triggering pulse to initiate the square wave; the advantage of this type of circuit is that pulses unequally spaced in time may be made to synchronize and appear as a single stationary pattern on the screen. An external sweep voltage may be applied at the "HOR. INPUT" jack if switch S-3 is placed in the "O" position. *(See figs. 4-28 and 4-29.)*

(3) Figure 4-27 shows in detail the development of sawtooth sweep waveforms. The simplified schematic *(see fig. 4-27 and 4-28)* indicates that the multivibrator is a feed-back amplifier in which tube (2) can drive (1). In the oscillatory state, any slight disturbance such as thermal agitation develops a potential which builds up with extreme rapidity to the limit of tube conduction of tube (2). This portion of the sequence is indicated by A-B showing how the grid of tube (1) has been driven negative and the tube (1) cut off due to electrons piling up on capacitor "C'. This causes the grid bias to increase

Note: Not available at time of printing.

Figure 4-26. Chassis No. 6—Top View

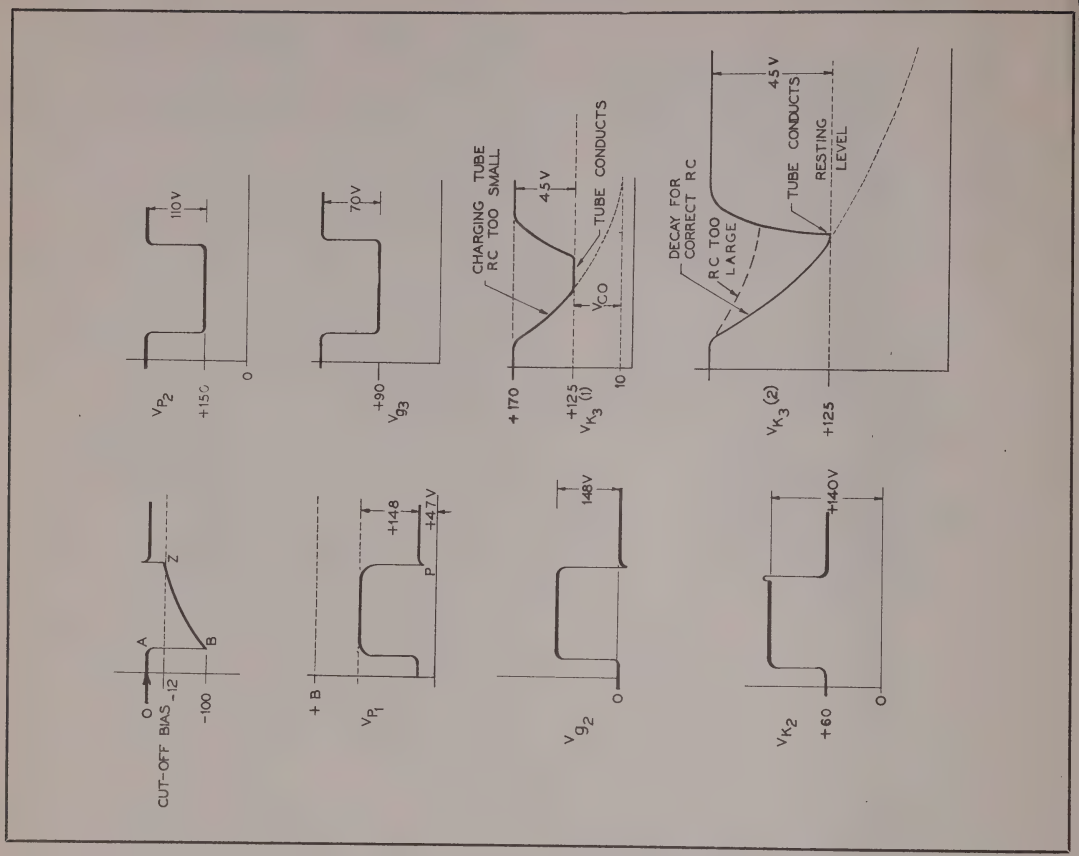


Figure 4-27. Wave Forms of Sweep Circuit

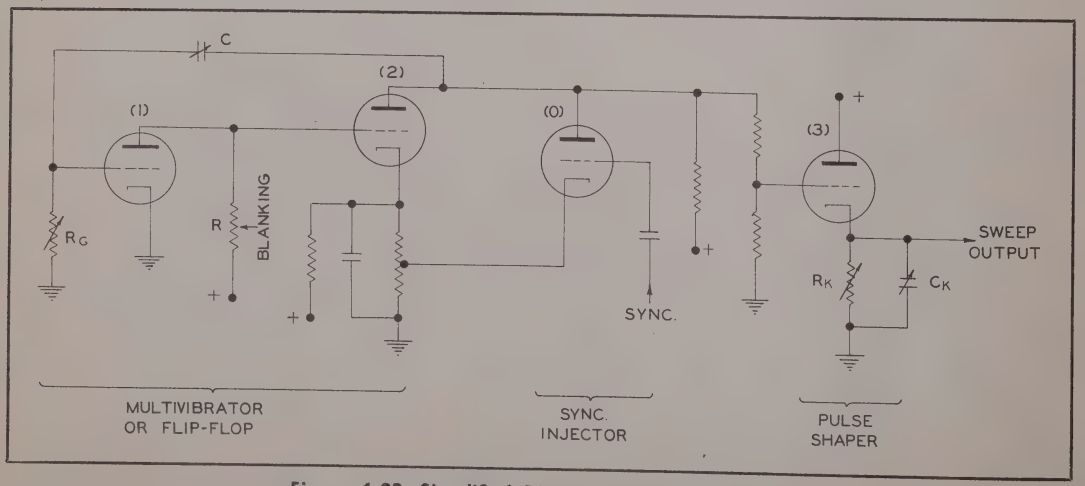


Figure 4-28. Simplified Diagram of Sweep Circuit

to about 80 volts. This capacitor charge then proceeds to decay exponentially (roughly linearly) through Rg along the curve Bz. At point Z cutoff bias is once more passed and the feedback network causes the grid to swing rapidly to point D; in fact an actual positive pip is observed at this point. Now that tube (1) is conducting again, the plate voltage drops and this drop in voltage is directly transmitted to the grid of tube (2). Tube (2) cuts off, and capacitor C begins to charge from the B plus supply, applying a positive swing to the grid of tube (1) causing it to conduct to the point of saturation. Notice that the cathode circuit of tube (2) has a fixed potential applied to it from the B plus supply. In addition to this, when tube (2) is conducting, the plate current flow through the cathode resistor raises the cathode considerably above ground. The capacitor which shunts this resistor takes on a high charge. When tube (2) is cut off by tube (1) this capacitor applies a bias to the cathode of about 90 volts. While tube (2) is cut off, this charge leaks off through the cathode resistor until the bias of the cathode reaches about 50 volts. Here conduction starts since the grid is about 45 volts above ground. When tube (2) starts to conduct, the whole cycle as described above is repeated. Vg-3 illustrates that tube (3), normally conducting heavily with a slightly positive grid, is cut off by a 90-volt wave, during which time the cathode capacitor at 180-200 volts discharges exponentially through Rk, forming a sawtooth wave that is nearly linear. It is this sawtooth which is used as a sweep and is fed to the horizontal amplifier. VK-3 (2) shows the correct operating waveform. Incorrect capacitance in the cathode of tube (3) may lead to wave of Vk-3 (1) in which the tube proceeds to conduct before the sweep time is over.

(4) In the self-oscillatory condition, this process repeats with negligible time between sweeps. *(See fig. 4-29.)* In the servo condition, however, the sweep is not repeated until the next triggering pulse appears at the synchronizing tubes. This waiting time between sweeps corresponds to zero bias at Vg-1. Tube (2) is induced to wait in the servo condition by means of overbias controlled by switch S-702 *(fig. 8-5)* which throws R-609 in and out of parallelism with R-605.

(5) A square wave is taken from potentiometer R-602 in the multivibrator and is applied to the grid of the cathode ray tube. This square wave is timed to begin and end with the sweep and raises the cathode ray tube grid to a point where conduction occurs only during the forward sweep. The negative portion of the square wave blanks out the return trace.

(6) This chassis contains a circuit for the introduction of external synchronizing voltage. This voltage is amplified and applied to the multivibrator in such a fashion that it controls the period of oscillation of the multivibrator. Thus the sweep will be timed by the ex-

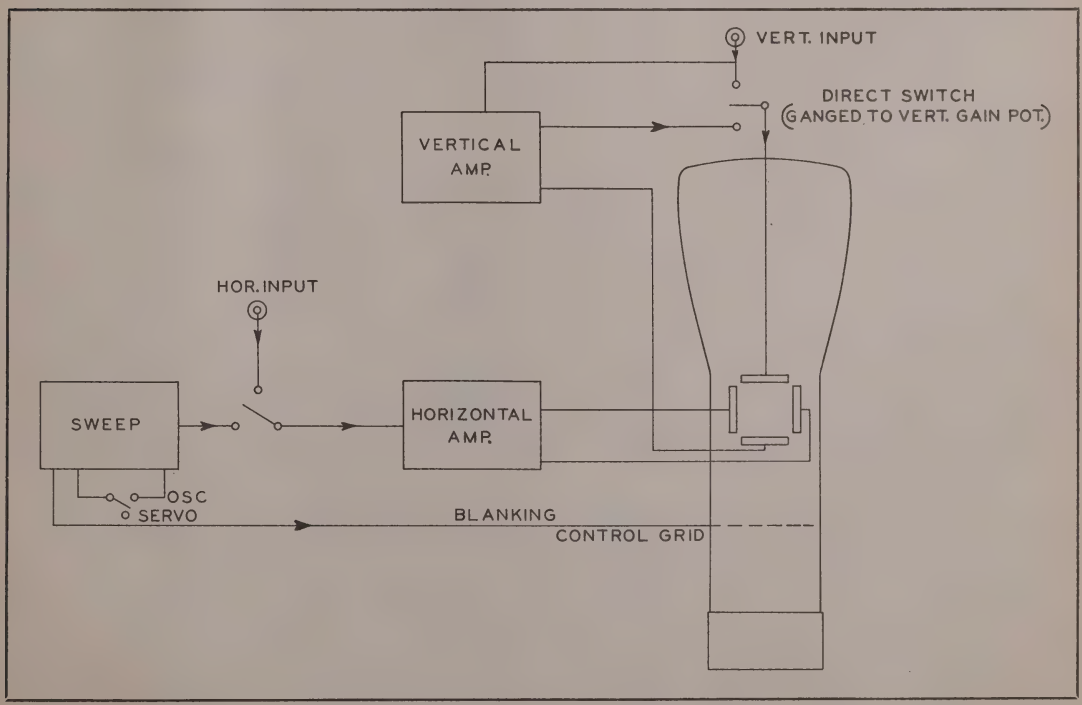


Figure 4-29. Block Diagram of CRO Channel

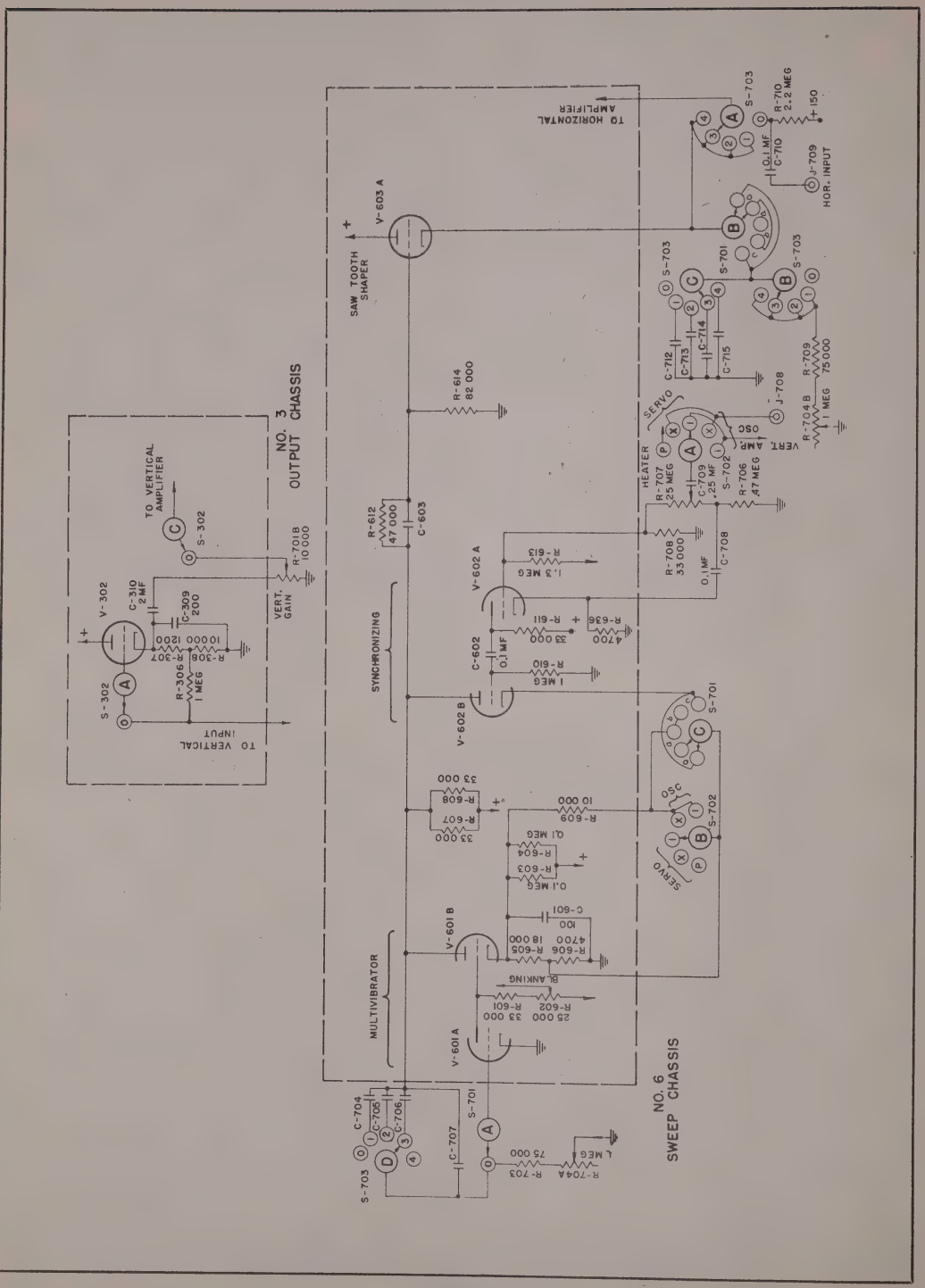


Figure 4-30. Simplified Diagram of CRO Channel

ternal timing circuit. A switch connection to heater circuit (SW-702A) provides power supply synchronization. *(See figs. 4-28 and 4-30.)*

(7) The sweep is amplified by tube V-604 and is applied to the horizontal plates of the cathode ray tube. The two halves of the horizontal amplifier are connected so as to aid each other. A fixed bias is supplied to the halves of this tube through R-712, the "HOR. CENTERING" control. By causing one half of the tube to conduct proportionately more than the other, the pattern on the screen may be shifted from one side to the other.

g. CHASSIS No. 8—AUDIO CHASSIS.

This chassis contains an amplifier V-801 used as a cathode follower. The input comes from the associated receivers in channels A and B, and from the push-pull amplifiers in channel C. There is no input in CRO operation. The output is taken from the cathode and is applied to the "PHONES" jack.

h. MAIN CHASSIS.—This chassis contains the front panel controls.

(1) The front panel sub-assembly mounts switches S-701A, S-701C, S-701B, S-702B, S-702A, S-703D, S-703C, S-703B, S-703A; potentiometers R-707, R-713, R-704A, R-704B, R-712A, R-712B; variable capacitor C-701; power switch S-705; and cord connectors.

(2) By function the switches are grouped as S-1 (Channel Selector), S-2 (Sync. Selector), S-3 (Coarse Sweep Speed). The "CHANNEL SELECTOR" switch has sections also in chassis 1, 2, and 3. A long shaft through these sub-assemblies effects single knob control of all sections.

(3) Switch S-703D controls the rate of square wave generation by the multivibrator. Switch S-703C controls the pulse-shaper network. It may be noted that the drive available to V-603B is controlled within limits by the values of capacitors C-712, C-713, C-714, C-715. The switch S-703C determines which one is used. The rate of decay of capacitor charge is proportional to RC, and by reducing C the steepness of the curve is increased, determining sweep speed.

(4) Switch S-702A with the co-functioning of S-701C and S-702B determine the nature of the synchronizing voltage for channel C and CRO positions. Switches S-701C and S-702B operate to avoid synchronizing action on the A and B bands and allow usual synchronizing action on the CRO position.

(5) It is noted that the "O" position of the "COARSE SWEEP SPEED" is only for horizontal input at jack J-709, and cannot be used in channels A, B, and C. When operation is desired in these channels do not place switch S-3 on "O."

(6) The 3-ampere fuse is in a holder mounted on the side chassis. It may be removed by unscrewing the top of the fuseholder with a screwdriver.

(7) The pilot light E-712 has a variable intensity. If it does not appear to light, rotate the bezel. The spare lamp is placed above chassis 2.

(8) The following controls appear on the panel: *(See figs. 8-1 and 8-2 for wiring diagrams.)*

Control	*Use*	*Reference in Fig.*
"SYNC"	Control of synchronizing voltage and polarity	(1)
"SWEEP SPEED FINE"	Sweep adjustment in CRO and C channels	(2)
'SWEEP SPEED COARSE"	Sweep adjustment in CRO and C channels	(3)
"ON-OFF POWER SWITCH"		(5)
"SYNC. SELECTOR"	Oscilloscope synchronizing in CRO channel, limited control in C	(7)
"CHANNEL SELECTOR"	Selecting channel of operation	(8)
"HOR. CENTERING"	Centering signal horizontally	(17)
"SWEEP WIDTH"	Controlling width on channel in A and B positions	(18)
"VERT. GAIN"	Controlling vertical amplitude of signals	(19)
"MAN. SWEEP"	Control of manual scaning on C channel	(20)

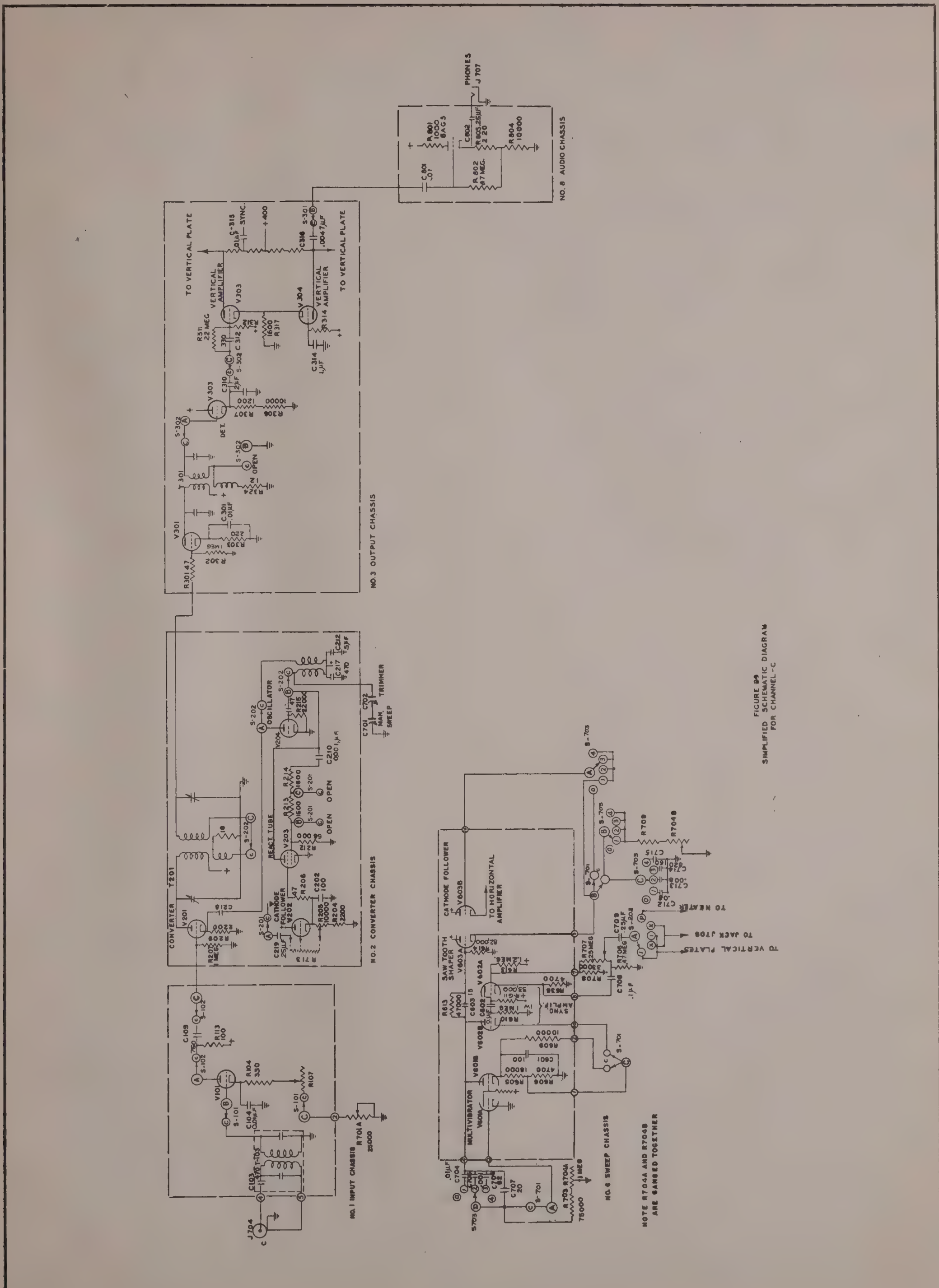

PHONES
J 707
R 801 1000 6AG5
C 801 .01
C802
R 805 .25µF 2 20
R 802 .47 MEG.
R 804 10000
NO. 8 AUDIO CHASSIS
TO VERTICAL PLATE
VERTICAL AMPLIFIER
V 303
V 304
C-315
SYNC.
+400
C316
S-301
.0047µF
R311 22 MEG
C 312
1600 R 317
R 314
C 314 1µF
C310 2µF
S-302
DET.
R 307 1200
R 308 10000
OPEN
V301
C 301 .01µF
R 303 220
R 302 1MEG
R301 47
R324
NO.3 OUTPUT CHASSIS
CONVERTER
T201
V201
R209
R208
R207 1 MEG
C218
S-201
C219 25µF
CATHODE FOLLOWER
V202
R206 47
C202 100
R205 10000
R204 2200
R713
REACT. TUBE
V203
R212
R213 1600
R214 1600
OPEN
S-202
OSCILLATOR
V204
R215 22000
C210 .0001µF
C217 470
C212 .5µF
C701
C702
MAN.
SWEEP
TRIMMER
NO.2 CONVERTER CHASSIS
C109
S-102
R113 100
V101
R104 330
R107
S-101
C104 0.01µF
T-105
C103 470
J704
R701A 25000
NO. 1 INPUT CHASSIS
CATHODE FOLLOWER
V603B
TO HORIZONTAL AMPLIFIER
SAW TOOTH SHAPER
V603A
R613 47000
C603 15
V602A
V602B
C602
R610
SYNC. AMPLIF.
R636 4700
R609 10000
C601 100
R605 18000
R606 4700
MULTIVIBRATOR
V601A
V601B
S-701
C704 .01µF
C707 20
R703 75000
R704A 1 MEG
S703
R707 25 MEG
R708 330000
R706 .47 MEG
C708 .1µF
C709 .25µF
S-202
TO JACK J708
TO VERTICAL PLATES
TO HEATER
C712 .08
C713 .008
C714 .020
C715
S-703
R709
R704B
NO. 6 SWEEP CHASSIS
NOTE R704A AND R704B ARE GANGED TOGETHER
FIGURE 24
SIMPLIFIED SCHEMATIC DIAGRAM FOR CHANNEL-C

Figure 4-31. Simplified Schematic Diagram For Channel C

SECTION V
MAINTENANCE

1. CHANGING FUSE.

WARNING

High voltage is present in this equipment. Turn power off before removing the indicator from the case.

a. Remove locking nuts holding Indicator ID-60/APA-10 to the mounting base.

b. Remove chassis of the indicator from its case. It may be necessary to disconnect all cables in order to reach the spare fuse.

c. Spare fuse will usually be found beside chassis 2 in a clip.

d. After the cause of the burn-out has been determined and repaired, place the good fuse in fuseholder on the side of the chassis.

e. Replace Indicator ID-60/APA-10 in case and secure to base. Make the necessary connections.

2. CHANGING PILOT LAMP.

a. Remove lamp bezel from panel of indicator by turning in counterclockwise direction.

b. Remove defective lamp by pushing in slightly on the lamp and turning it an eighth of a turn.

c. Remove Indicator ID-60/APA-10 from case. Locate the spare lamp in holding clip above chassis No. 2.

d. Insert good lamp in panel socket and replace bezel.

e. Replace indicator in case and make connections.

3. DAILY INSPECTION.

IMPORTANT

Periodic inspections prescribed herein represent minimum requirements. If, because of local conditions, peculiarities of equipment, or abnormal usage, they are found insufficient to attain satisfactory operation of equipment, local authority should not hesitate to increase their scope or frequency.

a. Make certain that all cables are connected properly.

b. Throw "ON-OFF" switch to "ON" position.

c. Turn bezel and notice whether pilot light glows. (If it does not, examine fuse.)

d. Determine whether or not trace appears on screen after warming up.

e. Rotate "CHANNEL SELECTOR" switch through all positions and see that trace appears on each channel.

f. Rotate "SWEEP SPEED FINE" and "SWEEP SPEED COARSE" controls and note the trace. If a trace appears on only one or two positions, this will localize any trouble present.

g. Turn on the associated receiver and tune to a signal. Listen to headphones to determine whether receiver is operating.

h. Adjust the width of the sweep as instructed in section II, par. 5 if necessary.

j. If signal peaks appears to be normal, turn off the set.

4. 100-HOUR INSPECTION.

a. Remove cable connections, etc., and remove Indicator ID-60/APA-10 from mounting.

b. Set up the equipment on a bench where power is available.

c. With power "ON-OFF" switch turned "ON" make the following voltage checks: (All in chassis 4)

Terminal	*Voltage*
1-5	150 d-c
1-2	300 d-c
1-4	400 d-c

d. Make following visual checks:

(1) See that pilot light is on.

(2) See that voltage regulator tubes glow.

(3) See that a spot or trace appears on the screen.

e. Turn power "OFF" and measure resistances: (Chassis 4)

Terminal	*Resistance*
1 to 5	25,000 ohms
1 to 2	15,000 ohms
1 to 4	15,000 ohms

f. Turn power switch "ON." Set the "HOR. GAIN" control to maximum. The sweep should be at least three inches in all of the following switch positions:

Channel Selector	*Sync. Selector*	*Coarse Speed*
CRO	Osc. (Int. or Ext.)	Middle
A	Any	Any
B	Any	Any
C	Any	Middle

If trace is not three inches, test the horizontal amplifier tube V-604.

g. To test the vertical amplifiers:

(1) Set "VERT. GAIN" control to maximum.

(2) Set "CHANNEL SELECTOR" switch to CRO.

(3) Introduce an a-c signal at "VERT. INPUT" and see that it appears on screen.

h. Rotate the focus control and observe effect. Set it for a sharp, well-defined point.

i. Adjusting adapter channels:

(1) Align i-f to 3.9 megacycles. (Alignment instructions given in paragraph 6, this section.)

(2) Set "SWEEP WIDTH" control to zero. Adjust "CENTER FREQUENCY" control so there is about 50 volts (above ground) on screen of reactance tube.

j. With "SWEEP WIDTH" control at minimum, determine frequencies of the oscillator. These frequencies should be:

(1) Channel A ..... 4.35 megacycles
(2) Channel B ..... 9.15 megacycles
(3) Channel C ..... 33.9 megacycles

k. To test "PHONES" channel, apply a modulated signal of 30 megacycles (modulated by 400 cycles) to the channel C input, with "CHANNEL SELECTOR" switch in C position. A tone should be heard in the headphones.

l. To check the synchronizing circuit:

(1) Inject 3-volt, 1000-cycle audio frequency signal into "VERT. INPUT" and "EXT. SYNC." jack. Place "SYNC. SELECTOR" control on "OSC.-EXT." The signal must synchronize satisfactorily and "lock in" at either extreme, plus or minus of "SYNC." control.

(2) Place "SYNC. SELECTOR" on "SERVO-EXT." The sweep must trigger at either extreme (plus or minus) of "SYNC." control.

(3) Remove audio input from "EXT. SYNC." but not from "VERT. INPUT." The sweep must not trigger in any position of the "SYNC." control.

(4) Place the "SYNC. SELECTOR" on "OSC.-INT." The pattern must lock in as described above. Repeat with "SYNC. SELECTOR" on "SERVO-INT." Let the vertical gain be sufficient to give a pattern at least 1½" high.

(5) Remove audio excitation. Place "SYNC. SELECTOR" on "SERVO-POWER." The sweep must trigger on any position of "SWEEP SPEED COARSE" except "O."

m. When alignment is completed, install Indicator ID-60/APA-10 on mounting base and connect cables.

5. MODIFICATION OF ANY RECEIVER.

a. Almost any receiver may be modified to be used with Panoramic Adapter AN/APA-10. Modification consists of providing a coaxial cable outlet on the receiver chassis, which is connected to the converter plate through an isolation network as indicated in figure 5-1.

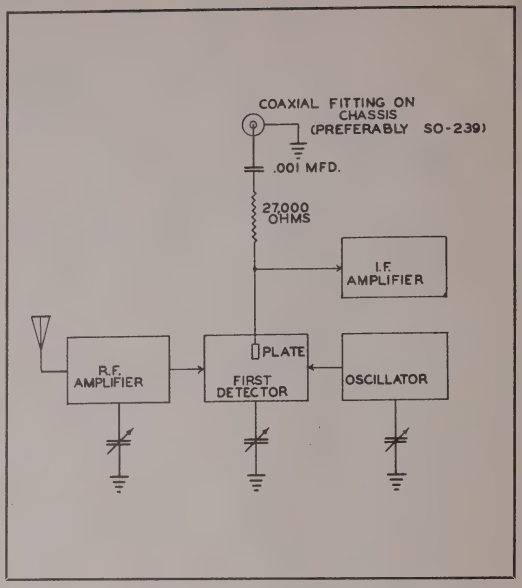


Figure 5-1. Modification of Any Superheterodyne Receiver

b. This isolation network consists of a 27,000-ohm resistor connected to the plate of the converter tube in the receiver. The other end of the resistor is connected in series with a .001 microfarad coupling capacitor and this is connected to a coaxial fitting on the receiver chassis (preferably Socket SO-239). This is the output jack of the receiver.

c. It is quite possible that the realignment of the receiver will be necessary following modification.

6. ALIGNMENT OF THE ADAPTER.

a. GENERAL.—The procedure outlined here should be followed since a hit or miss procedure will result in improper operation. Alignment should not be attempted by other than skilled personnel since proper operation of the equipment is dependent on accurate alignment of the various circuits. *(See fig. 5-2.)* Twenty trimmer adjustments and three potentiometer adjustments are provided for complete alignment of the equipment. In alignment, a signal generator with a maximum output of 1 volt and covering a frequency range from 455 kilocycles to 31 megacycles with provision for 400-cycle modulation is needed.

b. ALIGNMENT OF I-F AMPLIFIER TO 3.9 MEGACYCLES.

(1) Set "SWEEP WIDTH" control to minimum.

(2) Set "CHANNEL SELECTOR" switch to B.

(3) Feed a 3.9-megacycle modulated signal into the grid of the converter tube on chassis 2. (Apply this signal to jack pin No. 2 on this chassis.)

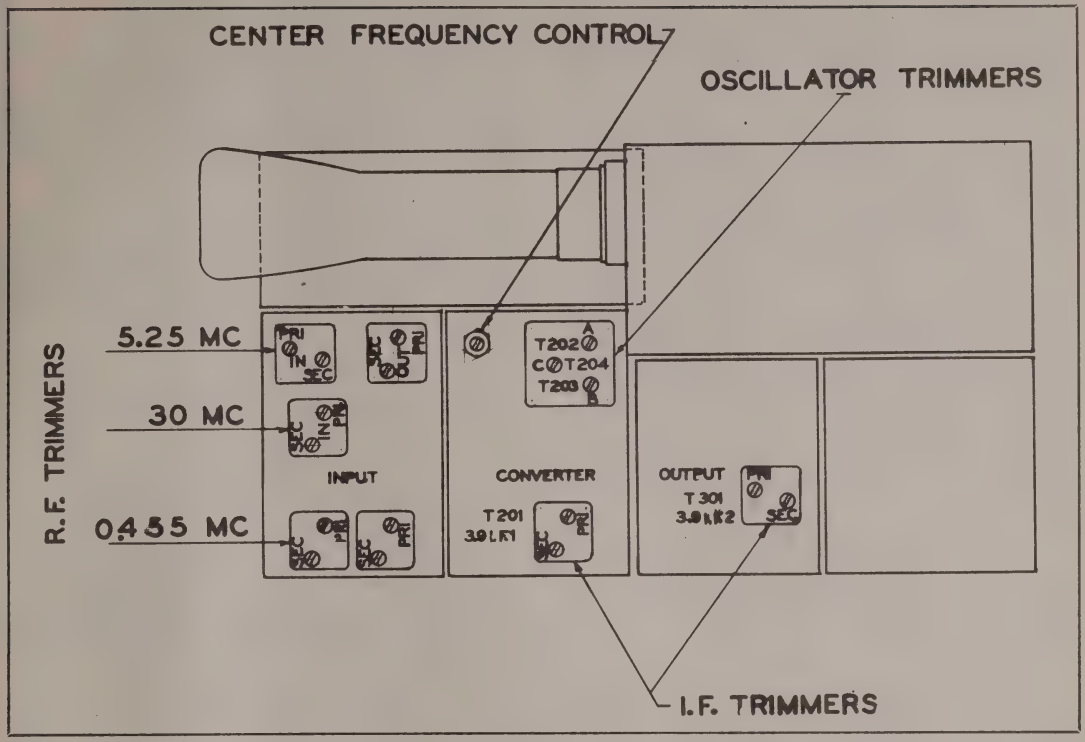


Figure 5-2. Alignment Adjustments

(4) Adjust the trimmers on T-201 and T-301 until maximum deflection of the picture is obtained reducing the input signal as necessary to keep the trace on the screen. This is the preliminary i-f adjustment. The final adjustment cannot be made until the B-channel oscillator and frequency modulator are aligned.

c. ALIGNMENT OF B-CHANNEL FREQUENCY MODULATED OSCILLATOR.

Note

The B-channel oscillator must be aligned before the other oscillator channel alignment operations are attempted.

(1) Set "CHANNEL SELECTOR" in the B position.

(2) Set "SWEEP WIDTH" control at maximum.

(3) Set the B channel "DEVIATION LIMIT" control to maximum (clockwise).

(4) Feed an unmodulated signal of 5.25 megacycles into the B-jack on the panel. Adjust the signal strength from the generator until a pulse about ½" high is obtained on the screen.

(5) Adjust the B-oscillator inductance trimmer on T-202 until the peak is centered at zero on the horizontal axis.

(6) If a symmetrical pulse is not obtained when the "SWEEP WIDTH" control is rotated one fourth from its maximum clockwise position, the i-f trimmers on T-201 and T-301 must be carefully adjusted until the curve is fairly symmetrical and equally balanced on either side of the center line. Normally these trimmers will require some readjustment.

d. CENTER FREQUENCY ADJUSTMENT.

(1) Set the "SWEEP WIDTH" control to maximum (clockwise).

(2) Feed a 5.75-megacycle signal into the B-jack and adjust the "B DEVIATION LIMIT" control until the pulse is centered at the right hand 5 on the screen.

(3) Change the signal frequency output from the generator to 4.75 megacycles and adjust the "CENTER FREQUENCY" control until the pulse is centered at the left hand 5 on the screen.

(4) Change the signal frequency output from the generator to 5.25 megacycles and adjust the B inductance trimmer on T-202 until the pulse is centered at zero on the screen.

(5) Change the signal frequency output from the generator to 5.75 megacycles and adjust the "B DEVIATION LIMIT" control until the pulse is centered at the right hand 5 on the screen.

(6) Repeat steps 1, 2, 3, and 4 consecutively and enough times until the space between each +5 and 0 represents a band 500 kilocycles wide, in other words, until 4.75 megacycles falls at 5, 5.25 megacycles at 0, and 5.75 megacycles at 5. An error of one half division in making these adjustments is not excessive.

(7) Set "SWEEP WIDTH" control to minimum (counterclockwise), feed in a 5.25-megacycle unmodulated signal and carefully adjust the center frequency control until the entire base line rises and flattens off. Set "SWEEP WIDTH" control to maximum and adjust the "HORIZONTAL CENTERING" control until the 5.25 pulse is centered at zero on the screen. Readjust the "HOR. GAIN" control so that the trace just covers the screen. *Do not disturb the "HORIZONTAL CENTERING" control until the A channel oscillator has been adjusted.*

(8) When this procedure has been carried out the sweep from 4.75 megacycles to 5.25 megacycles is linear. Once the "CENTER FREQUENCY CONTROL" has been adjusted for the B channel, it must not be disturbed in making any other adjustments.

e. ALIGNMENT OF A CHANNEL OSCILLATOR.

(1) Set "CHANNEL SELECTOR" switch in A position.

(2) Set "SWEEP WIDTH" control at maximum clockwise position.

(3) Feed an unmodulated signal at 455 kilocycles into the A jack. Adjust the A oscillator inductance trimmer on T-202 until the peak is centered on the zero line on the screen.

(4) Set "SWEEP WIDTH" control at minimum. Feed a 455 kilocycle unmodulated signal into the A jack and readjust the A oscillator inductance trimmer core on T-202 until the base line rises in a gradual arc with its maximum at the center of the screen.

(5) Turn off the modulation and set the signal generator to 505 kilocycles. Set the "SWEEP WIDTH" control to maximum. Adjust the "A DEVIATION LIMIT" control *(29 on fig. 2-7)* and note whether the peak falls at 5 on the screen. Repeat the A band oscillator adjustments.

f. ALIGNMENT OF C-CHANNEL OSCILLATOR.

(1) Set "CHANNEL SELECTOR" switch in C position.

(2) Set "MAN. SWEEP" control to the plus 1 mark.

(3) Feed a 31-megacycle unmodulated signal into the C Input jack. An input of at least one volt should be used. Adjust the C channel inductance trimmer on T-202 until maximum amplitude of the picture is obtained.

(4) Set "MAN. SWEEP" to minus 1. Feed a signal of 29 megacycles (unmodulated) into the C input jack and adjust the "MAN. SWEEP TRIMMER" *(32 on fig. 2-7)* until the maximum signal amplitude is obtained.

(5) Repeat steps (3) and (4).

(6) Set the C "MAN. SWEEP" to zero. Feed an unmodulated signal of 30 megacycles into the C input jack and adjust the C channel oscillator inductance trimmer until the maximum amplitude of the picture is obtained.

(7) Repeat steps (3) and (4).

g. ALIGNMENT OF R-F TRANSFORMERS.

Note

In alignment of A, B, and C r-f transformers, insert a 27,000-ohm resistor in series between the signal generator and cord, and a capacitor shunted across the input to the adapter (inner to outer conductor of cord). The value of this capacitor will be 100 micromicrofarads for A channel, 50 micromicrofarads for B channel and 50 micromicrofarads for C channel.

(1) ALIGNMENT OF A CHANNEL (405-505 KILOCYCLES).

(a) Feed a multivibrator or pulse generator signal into Cord CD-800 in series with 27,000-ohm resistor and shunted by a capacitor of 100 micromicrofarads.

(b) Vary the frequency from 405 to 505 kilocycles and adjust the trimmers on the A-channel r-f transformers until the peaks fall at 415 and 495 kilocycles. Adjust the trimmers until the peak-to-trough ratio is approximately 7.

(c) Remove the multivibrator or pulse generator input lead and connect a sine wave generator. (Alignment can be made using sine wave signal generator alone.)

(d) Feed a 455-kilocycle signal into grid of V-101 and adjust the secondary trimmer of the A-band output transformer (T-104) for peak deflection.

(e) Feed 495-kilocycle signal into grid of V-101 and adjust the primary trimmer of the A-band output transformer for maximum deflection.

(f) Feed 415-kilocycle signal into grid of V-101 and readjust the secondary trimmer of the A-band output transformer for maximum deflection.

(g) Feed 455-kilocycle signal into input of Cord CD-800 (with resistor and capacitor mentioned previously) to the A-channel input jack and adjust secondary trimmer of A-band input transformer (T-101) for maximum deflection.

(h) Feed 495-kilocycle signal into input and readjust secondary trimmer of the A-band input transformer for maximum deflection.

(i) Adjust primary and secondary trimmers of both A-band input and output transformers until the peak deflections are approximately equal in amplitude and occur at 415 kilocycles and at 495 kilocycles.

(2) ALIGNMENT OF B-CHANNEL (4.75-5.75 MEGACYCLES) R-F TRANSFORMERS.

(a) Follow the same procedure as outlined for the A channel (both the pulse and signal generator methods) with the following exceptions.

(b) The shunt capacitance should be 50 micromicrofarads.

(c) Adjust trimmers at 4.85 and 5.65 megacycles.

(d) The peak to trough ratio should be approximately 9.

(3) ALIGNMENT OF C CHANNEL (29-31 MEGACYCLES).

(a) Place modulated signal of approximately one volt at 31 megacycles at input of the Cord CD-800 (20") in series with a 27,000-ohm resistor and shunted with a 50-micromicrofarad capacitor and tune with C "MAN. SWEEP" control to the signal.

(b) Adjust one trimmer to give maximum signal on screen.

(c) Change frequency of input signal to 29 megacycles and retune with C "MAN. SWEEP."

(d) Adjust the other trimmer to give maximum signal on screen.

(e) Readjust trimmers to give two peaks at 29 and 31 megacycles with a peak-to-trough ratio of approximately 1.1.

b. REMOVAL OF CHASSIS.—Removal of No. 3 or No. 6 chassis will defocus the beam. Therefore, the condition of focus should not be judged if either of these chassis has been removed.

7. RESISTANCE READINGS.

a. INPUT CHASSIS No. 1. (Chassis removed from main chassis.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		Ground	Infinite*	Switches in any position
Pin 2		Ground	Infinite	Switches in any position
Pin 3		Ground	Zero	Switches in any position
Pin 4		Ground	Infinite	Switches in any position
Pin 5		Ground	Zero	Switches in any position
Pin 6		Ground	Infinite	Switches in any position
Pin 7		Ground	Open‡	Switch S-102C in "O" position
Pin 7		Ground	Continuity	Switch S-102C in "A" position
Pin 7		Ground	100 ohms	Switch S-102C in "B" position
Pin 7		Ground	Infinite	Switch S-102C in "C" position
Pin 8		Ground	Infinite	Switch in any position
Pin 9		Ground	Infinite	Switch in any position
Pin 10		Ground	73,000 ohms	Switch in any position
Pin 11		Ground	Open	Switch in any position
Pin 12		Ground	Zero	Switch in any position
Pin 1		Any pin	Infinite	Switch in any position
Pin 2		Any pin	Infinite	Switch in any position

* "Infinite" is across capacitor.

‡ "Open" is no connection.

b. CONVERTER CHASSIS No. 2. (Chassis removed from main chassis.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		Ground	0	Switches in any position
Pin 2		Ground	1 megohm	Switches in any position
Pin 3		Ground	Infinite	Switches in any position
Pin 4		Ground	Infinite	Switches in any position
Pin 5		Ground	Infinite	Switches in any position
Pin 6		Ground	Infinite	Switch S-202C in "C" position
Pin 7		Ground	Continuity	Switches in any position
Pin 8		Ground	Infinite	Switch S-201A in "C" position
Pin 9		Ground	Open	Switches in any position
Pin 10		Ground	10,000 ohms	Central Frequency Control full right
Pin 11		Ground	500,000 ohms	Switches in any position
Pin 3		Pin 4	Continuity	Tubes in sockets
Pin 5		Pin 6	2,000 ohms	Switches in any position
Pin 8		Pin 6	Infinite	Switches in any position
Pin 10		Pin 3	Open	Switches in any position

c. OUTPUT CHASSIS No. 3. (Chassis removed from main chassis.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		Ground	1 megohm	Switches in any position
Pin 2		Ground	Infinite	Switches in any position
Pin 3		Ground	1 to 2.5 megohm	Depends on R324 and No. 1 (3-5)
Pin 4		Ground	Open	Switches in any position
Pin 5		Ground	1 megohm	Switches in any position
Pin 6		Ground	Open	Switches in any position
Pin 7		Ground	Open	Switches in any position
Pin 8		Ground	0	Switches in any position
Pin 9		Ground	Infinite	Switches in any position
Pin 10		Ground	Open	Switches in any position
Pin 11		Ground	Open	Switches in any position
Pin 12		Ground	Open	Switches in any position
Pin 13		Ground	Open	Switches in any position
Pin 14 Pin 14		Ground Ground	Open Open	Switch S-301B on "O", "A", "B" Switch S-301B on "C" position
Pins 15, 16		Ground	Open	Switches in any position
Pin 1		Pin 8	0	Switches in any position

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 3		Pin 17	2 to 3 megohms	Depends on R324
Pin 5		Pin 18	Infinite	Switches in any position
Pin 6		Pin 7	Continuity	Tubes in sockets
Pin 10		P n 12	Infinite	Switches in any position
Pin 10		Pin 13	60,000 ohms	Switches in any position
Pin 14		Pin 15	Continuity	S-301B on "A" position
Pin 14		Pin 15	Open	S-301B on "O" position
Pin 14		Pin 16	Continuity	S-301B on "B" position
Pin 14		Pin 16	Open	S-301B on "C" position
Pin 14		Pin 8	Open	As S-301B is rotated to any position

d. FILTER CHASSIS No. 4. (Chassis removed from main chassis.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		Ground	0	
Pin 2		Ground	100,000 ohms	Tubes in sockets
Pin 3		Ground	100,000 ohms	
Pin 4		Ground	100,000 ohms	
Pin 5		Ground	110,000 ohms	Tubes in sockets
Pin 3		Pin 4	250 ohms	
Pin 2		Pin 4	1,500 ohms	Tubes in sockets
Pin 2		Pin 5	9,500 ohms	
Pin 5		Pin 4	11,000 ohms	Tubes in sockets

e. POWER CHASSIS No. 5. (Chassis removed from main chassis.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		Ground	Open	Fuse in holder
Pin 2		Ground	Open	
Pin 3		Ground	250,000 ohms	
Pin 4		Ground	Open	
Pin 5		Ground	Open	
Pin 6		Ground	Open	Fuse in holder
Pin 7		Ground	Open	
Pin 8		Ground	Infinite	
Pin 9		Ground	Open	
Pin 10		Ground	Open	
Pin 1		Pin 6	Continuity	Fuse in holder
Pin 2		Pin 7	Continuity	
Pin 9		Pin 10	Open	C. R. tube in socket
Pin 4		Pin 5	Open	C. R. tube in socket

f. SWEEP CHASSIS No. 6. (Chassis removed from main chassis.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		Ground	4,700 ohms	
Pin 2		Ground	27,000 ohms	
Pin 3		Ground	Open	V603 in socket
Pin 4		Ground	130,000 ohms	V603 in socket
Pin 6		Ground	67,000 ohms	V601 in socket
Pin 7		Ground	1.2 megohms	
Pin 8		Ground	4,700 ohms	V602 in socket
Pin 9		Ground	Open	V601 in socket
Pin 10		Ground	Open	V602 in socke·
Pin 11		Ground	0	
Pins 12, 13		Ground	Open	All tubes in sockets
Pin 14		Ground	2.3 megohms	V604 in socket
Pin 15		Ground	2.3 megohms	V604 in socket
Pin 16		Ground	Open	V603 in socket
Pin 17		Ground	87,000 ohms	R605 maximum
Pins 18, 19, 20, 21		Ground	Open	V604 in socket
Pin 1		Pin 6	62,000 ohms	
Pin 1		Pin 2	22,000 ohms	
Pin 6		Pin 17	25,000 ohms	R605 at maximum
Pin 6		Pin 4	17,000 ohms	
Pin 6		Pin 7	1.2 megohms	
Pin 18		Pin 20	87,000 ohms	V604 in socket
Pin 18		Pin 19	54,000 ohms	V604 in socket
Pin 19		Pin 20	33,000 ohms	V604 in socket
Pin 20		Pin 21	10,000 ohms	V604 in socket
Pin 12		Pin 13	Continuity	Tubes in socket
Pin 10		Pin 12	Open	Tubes in socket

g. MAIN CHASSIS, SWEEP CHASSIS TERMINALS. (Six small chassis removed.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 4		Ground	1 megohm	Switches in any position
Pin 9		Ground	1 megohm	S-701A in "O", "A", "B", "C", position R704 minimum
Pin 4		Pin 9	Infinite	S-701A on "O" or "C"; S3 on "O", "1", "2", "3", "4"
Pin 7		Ground	33,000 ohms	
Pin 8		Ground	Infinite	

g. MAIN CHASSIS, SWEEP CHASSIS TERMINALS. (Six small chassis removed.) (continued)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 11		Ground	0	
Pins 1, 2, 10		Ground	0	S-701C and S-702B in any position
Pin 2		Pin 10	Continuity	S-701C on "C" position
Pin 2		Pin 10	Open	S-701C on "O", "A", "B" positions
Pin 1		Pin 2	Continuity	S-702B on "OSC"
Pin 1		Pin 2	Open	S-702B on "SERVO"
Pin 1		Pin 10	Continuity	S-701C on "O" or "C"
Pin 1		Pin 10	Open	S-701C on "A" or "B"
Pins 7, 8		J708	1,000 cycle continuity	S-702A on "OSC. X" or "SERVO X" R707 should control amplitude
Pin 3		Pin 16	Continuity	All positions of S-701B and S-703A
Pin 3		J709	1,000 cycle continuity	S-703A on "O"
Pin 3		Ground	1 megohm	S-701B on "A" or "B"
Pin 3		Ground	1 megohm	S-701B on "O" or "C" S-703B on "1", "2", "3", or "4" R704B minimum
Pin 16		Ground	Open	S-701B on "O"; 7.7 any position; S-703B on "O"
Pin 15		Ground	1 megohm	R712A maximum
Pin 14		Ground	1 megohm	R-712B maximum
Pin 17		Pin 8 (Power Chassis Terminals)	Continuity	
Pin 6		Pin 8 (Power Chassis Terminals)	25,000 ohms	R605 maximum
Pin 6		Pin 2 (Filter Chassis Terminals)	Continuity	
Pin 19		Pin 4 (Filter Chassis Terminals)	Continuity	
Pin 18		Pin 10 (Power Chassis Terminals)	Continuity	
Pin 20		Pin 9 (Power Chassis Terminals)	Continuity	
Pins 18, 19, 20, 21, 9, 10, 2, 1, 17		Ground	Open	Switches in any position
Pin 6		Pins 14 or 15	0 to 1 megohm	Vary R712A and R712B
Pins 12 or 13		Pins 3 or 4 (Power Chassis Terminals)	Continuity	
Pins 12 or 13		Pin 6	100,000 ohms	
Pins 12 or 13		Ground	180,000 ohms	
Pins 12 or 13		Pin 5 (Filter Chassis Terminals)	100,000 ohms	
J 708		Ground	Infinite	
J 709		Ground	Infinite	

b. MAIN CHASSIS, POWER CHASSIS TERMINALS. (Seven small chassis removed.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		J701 (c)	Continuity	
Pin 2		J701 (a)	Continuity	
Pin 3		Pin 4	440 ohms	
Pin 5		Ground	Open	
Pin 9		V input	1,000 cycle continuity	S-704 Fully counterclockwise
Pin 9		Ground	Zero	Fully clockwise
Pin 9		Ground	4 megohms	Fully counterclockwise
Pin 9		Pin 4 (Filter chassis terminals)	4 megohms	Fully counterclockwise
Pin 9		Pin 5 (Output chassis terminals)	1,000 cycle continuity	
Pin 7		Ground	Open	
Pin 7		Pin 13 (Output chassis terminals)	Continuity	

i. MAIN CHASSIS, FILTER CHASSIS TERMINALS. (Seven small chassis removed.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 5		Pin 5 (Converter chassis terminals)	Continuity	
Pin 5		Ground	100,000 ohms	
Pin 2		Ground	100,000 ohms	
Pin 4		Ground	Open	
Pin 4		Pin 11 (Output chassis terminals)	Continuity	
Pin 4		Pin 10 (Input chassis terminals)	Continuity	

j. MAIN CHASSIS, OUTPUT CHASSIS TERMINAS. (Seven small chassis removed.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 10		Ground	4.5 megohms	
Vert. input		Pin 10	Open to 1,000 cycles	
Vert. input		Pin 5	Continuity to 1,000 cycles	
Pin 2		Pin 5 (Converter chassis terminals)	Continuity	
Pin 17		Pin 18	10,000 ohms	R701B minimum
Pin 2		Pin 9	Continuity	
Pin 14		J708	Continuity	
Pin 14		Ground	Open	

j. MAIN CHASSIS, OUTPUT CHASSIS TERMINALS. (Seven small chassis removed.) (continued)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 15		J706	Continuity	
Pin 15		Ground	Open	
Pin 16		J705	Continuity	
Pin 16		Ground	Open	
Pin 1		Pin 7 (Converter chassis terminals)	Continuity	

k. MAIN CHASSIS, CONVERTER CHASSIS TERMINALS. (Seven small chassis removed.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 6		Ground	Infinite	C701 any setting
Pins 3, 4		Ground	180,000 Ohms	
Pins 3, 4		Ground	Continuity to 1,000 cycles	
Pin 5		Pins 3, 4	100,000 ohms	
Pin 7		Ground	Open	
Pin 11		Ground	Open	
Pin 2		Pin 7 (Input chassis terminals)	Continuity	
Pin 8		Pin 10	1 megohm	
Pin 9		Pin 10	0-1 megohm	Depends on R713 position
Pin 10		Ground	Open	

l. MAIN CHASSIS, INPUT CHASSIS TERMINALS. (Seven small chassis removed.)

Point	*To*	*Point*	*Approximate Resistance*	*Notes*
Pin 1		J702	Continuity	
Pin 1		Ground	Open	
Pin 2		Pin 12	1-25,000 ohms	Depends on R701A position
Pin 6		J703	Continuity	
Pin 6		Ground	Open	
Pin 4		J704	Continuity	
Pin 4		Ground	Open	
Pin 8		Pin 9	440 ohms	
Pin 3		Pin 5	0	

8. FAILURE SOURCES AND REMEDIES.

Failure	*Probable Source*	*Remedy*
Turning switch knob does not have proper effect. (Try turning knob back and forth).	Misalignment of switch wafers. (This is the most frequent cause of trouble in the equipment).	Open chassis, loosen mounting screws, adjust faulty wafer, realign, tighten.
Fuse blows repeatedly.	Probably shorted leads due to crowded chassis.	Replace chassis until short is corrected.
Edges of base line rise to top of screen.	Oscillation in Chassis No. 1.	Be sure that screws on switch are grounded.
Pilot light out, no beam trace on screen.	Fuse blown.	Check to determine cause of fuse failure; replace fuse.
Pilot light on, no trace on screen.	Faulty tube, defective wiring, line voltage sub-normal, HOR CENT. control in extreme position.	Check tubes. See if VT tubes are glowing; if not, check line voltage.
Pilot on, trace screen but no signals appearing.	Improper receiver, or wrong connections to receiver. Sweep width may be set at zero.	Check receiver-cable connections.
Adapter operating, no signal in phones.	Defective audio circuits (adapter or receiver) or cable connections.	Check receiver phone jack with headset. Check cabling.
Inability to center peak, or extremely low gain.	Video amplifier in Chassis 3—one tube not operating.	Check tube voltages, replace tubes.
No horizontal sweep, vertical deflection ok.	"COARSE" sweep speed on "O".	Set "COURSE" control off "O" position.
Random hash or pokes on trace at all positions of switches.	Deflective high voltage power supply.	Check power transformer for incipient breakdown.

SECTION VI
SUPPLEMENTARY DATA

1. TUBE COMPLEMENT.

Tube Desig.		*Type*	*Function*
Chassis 1	V101	JAN-6AK5	R-F Amplifier
	V102	JAN-OD3/VR150	Voltage regulators
Chassis 2	V204	JAN-6AK5	R-F Oscillator
	V203	JAN-6AK5	Reactance tube
	V201	JAN-6AK5	Converter
	V202	JAN-6AK5	Cathode follower
Chassis 3	V302	JAN-6AK5	Detector in A, B, C channels; cathode follower in CRO channel
	V301	JAN-6AK5	I-F amplifier
	V303	JAN-6AG5	Video amplifier
	V304	JAN-6AG5	Video amplifier
Chassis 4	V401	JAN-00D3/VR150	Voltage regulators
	V402	JAN-00D3/VR150	Voltage regulators
Chassis 5	V501	JAN-5R4GY	Low Voltage, full wave recifier
	V502	JAN-2X2	High voltage, half wave rectifier
	V503	JAN-6AK5	D-C reinserter (maintains beam intensity constant)
Chassis 6	V601	JAN-6SN7GT	Multivibrator (both sections)
	V602	JAN-6SN7GT	Synchronizing (both sections)
	V603A	JAN-6SN7GT	Sawtooth shaper
	V603B	JAN-6SN7GT	Cathode follower
	V604	JAN-6SN7GT	Horizontal amplifier (both sections)
Chassis 8	V801	JAN-6AG5	Audio output tube

2. R-F BAND-PASS TRANSFORMERS.

a. Capacitors used to resonate the transformers are air dielectric type and should be shunted by appropriate temperature compensating fixed capacitors, such as Ceramicons so that the transformers remain resonated with ±5 percent of the mean frequency under conditions of temperature variations from 50° C. to 70° C.

d. Operating frequency fo, 30 megacycles; gain between Vl and Ve, 10x; pass-band between Vl and Ve, 100 kilocycles; P/T 8. ±20 percent; peak separation, 90 kilocycles; Cx, 125 micromicrofarads ±10 micromicrofarads.

c. Operating frequency fo, 5.25 megacycles; gain between Vl and Ve, 2x; pass-band between Vl and Ve, 1000 kilocycles; P/T, 10. ±20 percent; peak separation, 900 kilocycles; Cx, 100 micromicrofarads ±8 micromicrofarads.

d. Operating frequency fo, 30 megacycles; gain between Vl and Ve, 0.5x; pass-band between Vl and Vo, 2000 kilocycles; P/T, 1.1 ±20 percent; peak separation, 1800 kilocycles; Cx, 100 micromicrofarads ±8 micromicrofarads.

3. SUMMARY OF CHARACTERISTICS.

a. See the following table for a general summary of characteristics of Panoramic Adapter AN/APA-10.

Overall Dimensions: ..... 19 9/16" x 10 1/4" x 7 5/8"

Weight: ..... 40 lbs.

Power Requirements: ..... 105-125 v. ac, 400-2600 cycles or 75-85 v. ac (by changing transformer tap.) Power input approximately 140 watts.

Sensitivity: ..... A channel, 400 microvolts or less per 1/4" beam deflection. B channel, 400 microvolts or less per 1/4" beam deflection. C channel, 1 volt or less per 1/4" beam deflection.

Resolution: ..... 12 kilocycles at 3 db down from peak, sweep control at miximum, using CW signal.

Presentation: ..... Panoramic (A and B channels); oscillographic, C channel.

Sweep Width: ..... Channel A, ±50 kilocycles (100 kilocycles overall)
Channel B, ±500 kilocycles (1 megacycle overall)
Channel C, ±1 megacycle (2 megacycles overall, manually)

Cathode Ray Sweep: ..... Oscillatory or non-oscillatory (Servo). Variable sawtooth generator, 35 to 40,000 cycles per second.

Audio Output: ..... 50 milliwatts into 600-or 8000-ohm load.

Vertical Amplifier: ..... Single stage, ±2 db from 30 cycles to 100 kilocycles or higher. Amplifier out position permits direct connection to one vertical plate through coupling capacitor.

Horizontal Amplifier: ..... Single stage, ±2 db from 30 cycles to 100 kilocycles. No provision for direct connection to deflection plates.

Cathode Ray Tube Voltage: ..... Cathode to accelerating anode: 1200 v. dc for 115 v. ac in.

Sensitivity of Cathode Ray Oscilloscope:	*Horizontal*	*Vertical*
Maximum through amplifier	10 volts peak to peak per inch	1.5 volts peak to peak per inch
Direct to Vertical Plate	150 volts peak to peak per inch	

Noise ..... No disturbance in excess of 25,000 microvolts between 200 kilocycles to 200 megacycles generated by equipment.

Fuse ..... Two amperes, 250 volts, cartridge.

b. The following are the approximate Cathode Ray Tube Impedances.

	VERT.		*HOR.*		*SYNC.*	
	Shunt Res. Meg.	*Shunt Cap. Mmf.*	*Shunt Res. Meg.*	*Shunt Cap. Mmf.*	*Shunt Res. Meg.*	*Shunt Cap. Mmf.*
Through Amplifier						
Input to High Impedance Probe Cord (CG-53/AP or CG-180/AP	12	30	12	30	10	30
Input to Low Impedance Probe Cord CG-113/AP	2	190	2	95	.2	80
At Panel Jack	2	115	22	20	.2	10
Direct Connection to Plates, Vert. Gain Control Counterclockwise						
Input to High Impedance Probe Cord (Cord CG-53/AP or CG-180/AP)	12	30	—	—	—	—
Input to Low Impedance Probe Cord CG-113/AP	2	190	—	—	—	—
At Panel Jack	2	120	—	—	—	—

SECTION VII
PARTS CATALOGUE

Introduction

Table of Parts

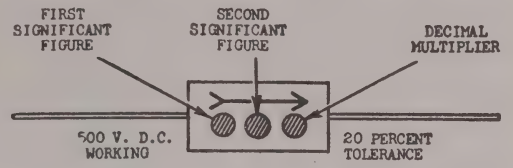
The parts listed in this table do not constitute a complete electrical and mechanical breakdown of the equipment. The table lists all electrical parts together with such operative mechanical parts as are subject to loss or failure, with the exception of structural and minor parts such as standard bolts, screws, nuts, and the like. In some instances individual detail parts of a sub-assembly may not be listed as separate items, since replacement of such items is impractical.

Ordering of Spare Parts

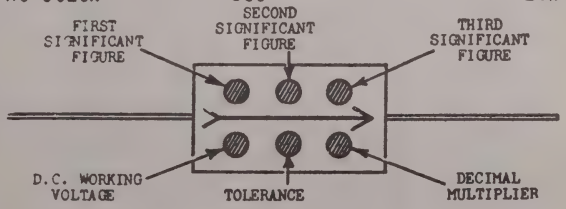
Each Service using this list has established certain depots and service groups for the storage and issue of spare parts to its organizations requiring them. The regulations of each Service should be studied to determine the method and source for requisitioning spare parts. The information in this list, as to manufacturer's or contractor's name, type, model, or drawing number, is not to be interpreted as authorization to field agencies to attempt to purchase identical or comparable spare parts directly from the manufacturer or a wholesale or retail store except under emergency conditions as covered by existing regulations of the Service concerned.

U. S. Army Personnel: This table is for information *only* and is not to be used as a basis for requisitioning parts. Authorities for obtaining maintenance items are as follows: 1. For using organizations: applicable Service publications of the 00-30 series of AAF Technical Orders. 2. For higher maintenance and supply echelons: applicable Service publications of the 08-55 series of AAF Technical Orders.

RMA COLOR CODES FOR CAPACITORS (MMFD)



COLOR	NUMERAL	VOLTS	MULTIPLIER	TOLERANCE
BLACK	0		1	
BROWN	1	100	10	1%
RED	2	200	100	2%
ORANGE	3	300	1,000	3%
YELLOW	4	400	10,000	4%
GREEN	5	500	100,000	5%
BLUE	6	600	1,000,000	6%
VIOLET	7	700	10,000.000	7%
GRAY	8	800	100,000,000	8%
WHITE	9	900	1,000,000,000	9%
GOLD		1000	0.1	5%
SILVER		2000	0.01	10%
NO COLOR		500		20%



RMA COLOR CODE FOR RESISTORS (OHMS)

COLOR	A 1ST DIGIT	B 2ND DIGIT	C MULTIPLIER
SILVER			0.01
GOLD			0.1
BLACK		0	1.0
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
PURPLE	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	

D - TOLERANCE CODE:

GOLD = 5% SILVER = 10% NO COLOR = 20%

OLD COLOR ARRANGEMENT

NEW COLOR ARRANGEMENT

BODY COLOR (NEW COLOR ARRANGEMENT ONLY) INDICATES TYPE OF RESISTOR, AS FOLLOWS:-

BLACK - COMPOSITION, NON-INSULATED
TAN, OLIVE OR WHITE - COMPOSITION, INSULATED
DARK BROWN - WIRE-WOUND, INSULATED

TABLE OF PARTS

Note

Parts listed which are indicated by a # sign in column 2 are not available as spare parts and are listed for reference purposes only.

MODEL: PANORAMIC ADAPTER AN/APA-10

Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or AWS Type*	*Cont. or Govt. Dwg. or Spec. No.*
C-101		CAPACITOR: Fixed; mica; single-section; .0047 microfarad ± 20%; 500 volts DCW.	Input coupling	Electromotive	TR 162.538
C-102		CAPACITOR: Fixed; mica; single section; micromicrofarad ± 10%; 500 volts DCW.	Input coupling	Micamold Type OXM	TR 162.552
C-103		CAPACITOR: Same as C-102.			
C-104		CAPACITOR: Fixed; mica; single section; .01 microfarad ± 10%; 600 volts DCW.	Cathode bypass	Sprague PX24A	TR 163.534
C-105		CAPACITOR: Same as C-102.	Screen bypass		
C-106		CAPACITOR: Fixed; paper; dual section; 0.25-0.25 microfarad; 600 volts DCW.	Plate bypass	Micamold No. 306-43Y	TR 163.546
C-107		CAPACITOR: Fixed; mica; single section; 500 volts DCW; 750 mmf.	Grid coupling	Electromotive	TR 162.553
C-117		CAPACITOR: Fixed; paper; single sect; .01 mf. ± 10%; 600 VDCW.	Heater bypass	Sprague PX24B	TR 163.536
C-217		CAPACITOR: Same as C-102.	Plate bypass		
C-219		CAPACITOR: Same as C-117.	Heater Bypass	SP 2528-5	Navy RE48A 129E
C-222		CAPACITOR: Fixed; paper; single sect; 0.25 mf. ± 20%; 600 VDCW.	Coupling conductor	Sprague No. 2545-2	TR 163.532
C-201		CAPACITOR: Same as 3-117.	Plate decoupling		
C-202		CAPACITOR: Fixed; mica; single-section; 100 micromicrofarad ± 20%; 300 volts DCW.	Bypass	Micamold Type Q	
C-203		CAPACITOR: Fixed; mica; single-section 4700 micromicrofarad ± 10%; 500 volts DCW.	Screen bypass	Micamold Type W	TR 162.538
C-204		CAPACITOR: Same as C-203.	Plate bypass		
C-205		CAPACITOR: Fixed; paper, single-sect; 0.5 mf; 600 VDCW.	Screen bypass	Micamold No. 306-39	TR 163.544
C-206		CAPACITOR: Fixed; ceramic; single-sect; 22 mmf. ± 20%; 300 volts DCW.	Phase shift	Erie resistor No. N750K.	TR 160.629
C-207		CAPACITOR: Fixed; ceramic; single-sect; 10 micromicrofarad ± 10%.	Phase shift	Erie resistor N750K102	TR 160.015
C-208		CAPACITOR: Same as C-206	Phase shift		
C-209		CAPACITOR: Same as C-102.	Plate bypass		
C-210		CAPACITOR: Fixed; mica; single-section; ± 20%; 500 volts DCW.	Grid blocking	Electromotive	

MODEL: PANORAMIC ADAPTER AN/APA-10

Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or AWS Type*	*Cont. or Govt. Dwg. or Spec. No.*
C-715		CAPACITOR: Fixed; mica; single-section; 160 micromicrofarad ± 5%; 500 volts DCW.	Pulse shaper	Electromotive	TR 162.562
C-716		CAPACITOR: Fixed; paper; single-section; .15 microfarad ± 10%; 600 volts DCW.	Pulse shaper	Sprague No. PX24B	TR 163.537
C-801		CAPACITOR: Same as C-210.	Grid blocking		
C-802		CAPACITOR: Same as C-502.	Blocking		
H-706		GROMMET: Rubber; for 1/16" panel; 9/16" OD x 1/4" ID x 1/4" thk; mounts in 5/16" hole.	Insulation	Canfield Rub 1975	TR 371.512
H-603		GROMMET: Rubber; for 1/16" panel 3/16" inside diameter; 7/16" outside diameter; 3/16" thick; mounts in 1/4" hole.	Insulation	CF 1653	TR 371.511
H-707		GROMMET: Rubber; for 1/16" panel; 3/8" inside diameter; 5/8" outside diameter; 5/16" thick; mounts in 1/2" panel hole.	Insulation	Canfield Rub 2027	TR 371.514
H-708		GROMMET: Rubber; 5/8" inside diameter; 1" outside diameter; 1/4" thick; mounts in 3/4" panel hole.	Insulation	Canfield Rub 2171	TR 371.515
L-401		COIL: Radio AF; 10 henries; 110 milliamperes; 3 1/2" x 2 3/4" x 2 1/2"; four 10/32" mounting screws 1/2" long; long; two ceramic insulated terminals 1 3/4" on centers.	Filter choke	UTC 81854	TR 232.007
L-201		COIL: Radio, RF; powdered iron core; square shield can size 2 15/32" long x 2" square; four No. 4 mounting screws 1 9/16" on centers; coil 1: 4.35 megacycles center freq. 9.15 megacycles center freq. 33.9 megacycles center freq.	Oscillator	TR	TRC A1395 251.131
N-701		DIAL: Calibrated disk; 1 1/2" x .064"; center hole .302" diameter; calibrated 1 megacycle from zero at center.	For manual sweep conductor	TRC 128.145	
F-501	3Z1927 — —	FUSE: Littlefuse type 3AG; 2 amperes; 250 volts; cartridge case; glass body; brass ends.	Power protection	Littlefuse 3AG-1043	TR 341.507
E-503	3Z3274 — —	HOLDER: Fuse; screwdriver extractor type; black bakelite; 5/8" diameter x 2 5/8"; two 1/8" mounting holes 1 3/8" in centers; for single 3 AG fuse.	Fuse holder	440-FH AL	TR 342.507
J-705		JACK: For audio input; equivalent of S.C. jack No. JK-33A; receives SC plugs PL-46, PL-68, and PL-168, also WECO No. 109; front cross-section 3/4" x 1 11/16"; spring lg 1 5/16", total lg 1 11/16".	Audio input	MALLORY SCA-2B	TR 421.512
J-707		JACK: For audio output; equivalent of SC jack No. JK-34A; receives SC plugs PL-47, PL-48, PL-55, PL-148, PL-155, also Mallory No. 75, WECO 47A and 47B; overall dimension same as for J-706.	Audio output	CTS	TR 421.511

TABLE OF PARTS

Note

Parts listed which are indicated by a # sign in column 2 are not available as spare parts and are listed for reference purposes only.

MODEL: PANORAMIC ADAPTER AN/APA-10

Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or AWS Type*	*Cont. or Govt. Dwg. or Spec. No.*
R-701		KNOB: Bar type; black bakelite; 1¼" x ½" x ⅝"; for ¼" shaft; 6/32" set screw.	Panel control	Natl Co HRP	TR 431.106
E-702		KNOB: Round; black bakelite; for ¼" shaft; double 6-32 x ½" set screws; white line arrow indicator; ⅞" diam. x 1 19/32" lg; (straight knurl).	Panel control	Multi Products	TRC A1085 · TR 431.116
E-703		KNOB: Without arrow indicator; same as E-702.	Panel control	Multi products	TRC A1085 TR 431.122
E-704		KNOB: 1⅛" diameter; same as E-702.	Panel control	Multi products	TRC A1085 TR 431.123
J-101	2Z5594.34 — —	MOUNTING: Female connector; phenolic strip; 3 1/16" x 7/16" x 3/16"; (six banana jacks 5/16" on centers; two .257" holes 2 9/16" on centers.)	Terminals chassis 1	TRC 554.015	TRC C-1951
JS-311	2Z5594-35 — —	BANANA JACK STRIP: 2¾" x ½" x 3/16"; five .136" holes 5/16" centers; two .144" holes 2¼" on centers.	Terminals chassis 4	TRC 554.019	C-1494
		Mounting: Female connector; 4" x ½" x ⅛"; (nine banana jacks 5/16" on centers; two .257" holes 3½" on centers.)	Terminals chassis	TRC 554.018	TR C-1953
J-501		MOUNTING: Female connector; 2 7/16" x 13/16" x ⅛"; (ten banana jacks 5/16" on centers; two holes .144" on centers; two columns.)	Terminals chassis 5	TRC 554.020	TR 1955
P-106		CONNECTOR: Male contact; 2 15/16" x 7/16" x 3/16"; six cont; six banana plugs; 5/16" on centers; (two holes .149", 2 9/16" on centers.)	Terminals chassis 1	TRC 554.003	TR C-1951
P-302		CONNECTOR: Male contact; 3 7/8" x 7/16" x 3/16"; nine cont; 9 banana plugs, 5/16" on centers; (two holes .149", 3½" on centers.)	Terminals chassis 3	TRC 554.006	TR C-1953
P-401		CONNECTOR: Male contact; 2⅝" x ½" x 3/16"; five cont; 5 banana plugs, 5/16" on centers; (two holes .149", 2¼" on centers.)	Terminals chassis 4	TRC 554.004	TR C-1954
P-602		CONNECTOR: Male contact; 2 1/16" x 15/16" x 3/16"; 8 cont; 8 banana plugs, 5/16" centers; 2" on center; two columns.	Terminals chassis	TRC 554.025	C-1222
P-601		CONNECTOR: Male contact; 2⅛" x 1½" x 3/16"; thirteen cont. 13 banana plugs, 5/16" on centers, three columns.)	Terminals chassis 6	TRC 554.009	TR C-1936
J-602		MOUNTING: Female connector; 2⅜" x 13/16" x 3/16"; eight banana jacks, 5/16" on centers; two columns; two holes .144", 2" on centers.)	Terminals chassis 6	TRC 554.022	TR C-1956

MODEL: PANORAMIC ADAPTER AN/APA-10

Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or AWS Type*	*Cont. or Govt. Dwg. or Spec. No.*
T-101		TRANSFORMER: Variable RF; plug-in type; 2 windings; double tuned; 405-505 KC; square shield can 1⅜" square x 3½" long; two 3/48 mounting screws 1¼" diagonally on centers; powdered iron core; two trimmer capacitors.	Input coupling		TR 251.125
T-102	2Z9643.88 — —	TRANSFORMER: Variable RF; 4.75-5.75 mc; otherwise like T-101.	Input coupling	TR	TR 251.127
T-103	2Z9643.103 — —	TRANSFORMER: Variable RF; peaked at 30 megacycles; otherwise similar to T-101.	Input coupling		TR 251.129
T-104	2Z9641.114 — —	TRANSFORMER: Variable RF; same as T-101.	Interstage coupling	TR	TR 251.126
T-105	2Z9643.104 — —	TRANSFORMER: Variable R-F; 4.75-5.75 megacycles; powdered iron core, double tuned; variable silver trimmer capacitors; square shield can; size 3½" long x 1⅜" square; plug-in banana jack type; 6 pins; two 3/48 mounting screws ⅜"; 1½" diagonally on centers.	Interstage coupling	TR	TR 251.128
T-201		TRANSFORMER: I-f; 3.9 megacycles; input; powdered iron core; double tuned; variable silver trimmer capacitors; square shield can; size 3½" long x 1⅜" square; plug-in banana jack type; six pins; two 3/48 mounting screws ⅜"; 1½" diagonally on centers.	Interstage coupling	TR	TRC 1562 and 1575 TR 251.124-1
T-301		TRANSFORMER: Same as T-201.	Interstage coupling	TR	TRC 251.124-2
T-501		TRANSFORMER:Filament and plate; 4½" x 4 13/16" x 3⅝"; primary 0-80-115 volts, 900-2600 cycle a-c; 4 filament secondaries; 3 high voltage secondaries; insulated for 1500 volts d-c; four 10-32 mounting screws ½" long; ceramic insulated terminals ⅞" high.)	Power supply	Amartran No. 32536	TRC 852.511A
R-101		RESISTOR: Fixed; carbon; 100 ohms ± 10%; ½ watt.	Gain control	AB EB	TR 605-1011
R-102	3RC20BE221K — —	RESISTOR: Fixed; carbon; 220 ohms ohms ± 10%; ½ watt.	Cathode decoupling	AB EB	TR 605.2211
R-103		RESISTOR: Same as R-102.			
R-104	3RC20BE331K — —	RESISTOR: Fixed; carbon; 330 ohms ± 10%; ½ watt.	Sensitivity control	AB EB	TR 605.3311
R-105	3RC20BE103K — —	RESISTOR: Fixed; carbon; 10,000 ohms ± 10%; ½ watt.	Screen decoupling	AB EB	TR 605.1031
R-106		RESISTOR: Variable; single section; carbon; 25,000 ohms ± 20%; 1 watt; screwdriver slot.	Sensitivity "A"	Clarastat No. 37	TRC 650-253G

TABLE OF PARTS

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MODEL: PANORAMIC ADAPTER AN/APA-10

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R-107		RESISTOR: Variable; same as R-106.	Sensitivity "B"		
R-108		RESISTOR: Fixed; carbon; 470 ohms ± 10%; ½ watt.	Voltage divider	AB EB	TR 605.4711
R-109		RESISTOR: Same as R-108.			
R-111		RESISTOR: Fixed; wire wound; 2,500 ohms ± 10%; 10 watt.	Voltage divider	Clarostat Type 10C	TR 651.525
R-112		RESISTOR: Same as R-111.			
R-113		RESISTOR: Same as R-101.	Plate load		
R-115		RESISTOR: Same as R-101.	Suppressor		
R-202		RESISTOR: Variable; single section; carbon; 1 megohm ± 20%; 2 watt; screwdriver slot.	Deviation limit	AB Type J	TR 650.105H
R-203		RESISTOR: Variable; same as R-202.			
R-204	3RC20BE222K — —	RESISTOR: Fixed; carbon; 2200 ohms ± 10%; ½ watt.	Cathode bias	AB EB	605.2221
R-205		RESISTOR: Variable; single section; carbon; 10,000 ohms ± 20%; 2 watt; screwdriver slot.	Center frequency	AB Type 5	TRC 650.103P
R-206	3RC20BE470K — —	RESISTOR: Fixed; carbon; 47 ohms ± 10%; ½ watt.	Gain control	AB EB	TR 605.4701
R-207		RESISTOR: Fixed; carbon; 1 megohm ± 10%; ½ watt.	Grid leak	AB EB	TR 605.1051
R-208	3RC20BE221K — —	RESISTOR: Same as R-102.	Oscillator decoupling		
R-209	3RC20BE222K — —	RESISTOR: Same as R-204.	Cathode bias		
R-210	3RC20BE332K — —	RESISTOR: Fixed; carbon; 3300 ohms ± 10%; ½ watt.	Plate decoupling	AB EB	TR 605.3321
R-211	3RC20BE103K — —	RESISTOR: Same as R-105.	Screen decoupling		
R-212	3RC20BE563K — —	RESISTOR: Fixed; carbon; 56,000 ohms ± 10%; ½ watt.	Phase shift leak	AB EB	TR 605.5631
R-213	3Z6160 27 — —	RESISTOR: Fixed; carbon; 1600 ohms ± 10%; ½ watt.	Phase shift	AB EB	TR 605.1621

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R-214		RESISTOR: Same as R-213.			
R-215	3RC20BE223K — —	RESISTOR: Fixed; carbon; 22,000 ohms ± 10%; ½ watt.	Grid leak	AB EB	TR 605.2231
R-216	3RC20BE182K — —	RESISTOR: Fixed; carbon; 1800 ohms ± 10%; ½ watt.	Voltage dropping	AB EB	TR 605.1821
R-301	3RC20BE470K — —	RESISTOR: Same as R-206.	Gain control		
R-302	3RC20BE105K — —	RESISTOR: Same as R-207.	Grid leak		
R-303		RESISTOR: Same as R-102.	Cathode bias	AB EB	AB Y3770-D
R-304	3RC30BE332K — —	RESISTOR: Fixed; carbon; 3300 ohms ± 10%; 1 watt.	Decoupling cathode bias	AB GB	
R-305	3RC20BE331K — —	RESISTOR: Fixed; carbon; 330 ohms ± 10%; 1 watt.	Decoupling	AB GB	TR 601.3311
R-306	3RC20BE105K — —	RESISTOR: Same as R-207.	Grid leak		
R-307		RESISTOR: Fixed; carbon; 1200 ohms ohms ± 10%; ½ watt.	Cathode load	AB EB	TR 605.1221
R-308	3RC30BE103K — —	RESISTOR: Fixed; carbon; 10,000 ohms ± 10%; 1 watt.	Cathode bias	A-B GB	TR 601.1031
R-309		RESISTOR: Same as R-308.	Decoupling		
R-310		RESISTOR: Fixed; carbon; 33,000 ohms ± 10%; ½ watt.	Grid bias	A-B EB	TR 605.3331
R-311	3RC20BE224K — —	RESISTOR: Fixed; carbon; 220,000 ohms ± 10%; ½ watt.	Freq. compensation	A-B EB	TR 605.2241
R-312		RESISTOR: Fixed; carbon; 1.5 megohms ± 10%; ½ watt.	Grid bias	AB EB	TR 605.1551
R-313		RESISTOR: Fixed; carbon; 560,000 ohms ± 10%; ½ watt.	Grid bias	A-B	TR 605.5641
R-314		RESISTOR: Same as R-312.	Grid bias		
R-315		RESISTOR: Same as R-313.	Grid bias		
R-316		RESISTOR: Same as R-311.	Grid bias		
R-317		RESISTOR: Fixed; carbon; 1600 ohms ± 5%; ½ watt.	Cathode bias	AB EB	TR 605.1625
R-318		RESISTOR: Fixed; carbon; 8200 ohms ± 5%; ½ watt.	Screen decoupling	AB EB	TR 605.8225

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R-319		RESISTOR: Fixed; carbon; 15,000 ohms ± 10%; 2 watt.	Plate load	Speer No. SI-2	TR 602.1531
R-320		RESISTOR: Same as R-319.	Plate load		
R-321		RESISTOR: Fixed; carbon; 4700 ohms ± 10%; 1 watt.	Plate load	AB GB	TR 601.4721
R-322	3RC30BE473K — —	RESISTOR: Same as R-319.	Plate load		
R-323		RESISTOR: Same as R-319.	Plate load		
R-324		RESISTOR: Variable; double section; carbon; 1 megohm ± 20%; 2 watt.	Vertical centering	A-B Type J	TR 650.105J
R-325		RESISTOR: Fixed; carbon; 1000 ohms ± 10%; ½ w.	Filter	AB EB	TK 605.1021
R-326		RESISTOR: Variable; carbon; 500,000 ohms ± 20%; 2 w.	Beam deflection	AB Type J	TR 650.504D
R-401		RESISTOR: Fixed; carbon; 4700 ohms ± 10%; 2 watt.	Current equalizer	Speer resistor	TR 602.4721
R-402		RESISTOR: Same as R-401.			
R-403		RESISTOR: Fixed; carbon; 330,000 ohms ± 10%; 2 watt.	Bleeder	Speer resistor	TR 602.3341
R-404	3RC40AE104K — —	RESISTOR: Fixed; wire wound; 2700 ohms ± 10%; 20 watt.	Voltage dropping	Sprague Style E	TR 651.516
R-405		RESISTOR: Same as R-404.			
R-501		RESISTOR: Fixed; carbon; 47,000 ohms ± 10%; 1 watt.	Filtering	A-B GB	TR 601.4731
R-502		RESISTOR: Fixed; carbon; 22,000 ohms ±10%; 1 watt.	Filtering	A-B GB	TR 601.2231
R-503		RESISTOR: Fixed; carbon; 68,000 ohms ± 10%; ½ watt.	Filtering	AB EB	TR 605.6831
R-504	CRC20BE683K — —	RESISTOR: Same as R-503.	Voltage divider		
R-505	3RC20BE223K — —	RESISTOR: Same as R-215.	Voltage divider grid leak		
R-506		RESISTOR: Variable; single section; 100,000 ohms ± 20%; 2 watt.	Intensity	A-B Type J	TR 650.104E
R-507	3RC30BE104K — —	RESISTOR: Fixed; carbon; 100,000 ohms ± 10%; ½ watt.	Voltage divider	AB GB	TR 605.1041

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R-508		RESISTOR: Variable; single section; carbon; 250,000 ohms ± 20%; 2 watt.	Focus	A-B Type J	TR 650.254C
R-509		RESISTOR: Same as R-326.	Aux. focus		
R-510	3RC20BE155K — —	RESISTOR: Same as R-312.	Cathode ray tube grid bias		TR 650.155
R-511	3RC20BE105K — —	RESISTOR: Same as R-207.	D-C reinsertion		
R-512	3RC30BE154K — —	RESISTOR: Fixed; carbon; 150,000 ohms ± 10%; 1 watt.	Voltage divider	AB GB	TR 601.1541
R-513		RESISTOR: Same as R-512.			
R-514		RESISTOR: Fixed; carbon; 4.7 mogohms ± 10%; ½ watt.	Voltage divider	AB EB	TR 605.4751
R-515		RESISTOR: Same as R-514.			
R-516		RESISTOR: Fixed; WW; 1½ ohms ± 10%; 10 watt.	Voltage divider	Clarostat Type No. A-10-F	TR 651.526
R-601	3RC30BE333K — —	RESISTOR: Fixed; carbon; 33,000 ohms ± 10%; 2 watt.	Plate load	Speer resistor SI-2	TR 602.3331
R-602	2Z7270.110 — —	RESISTOR: Same as R-106.	Blanking		
R-603	3RC30BE104K — —	RESISTOR: Same as R-507.	Voltage divider		
R-604		RESISTOR: Same as R-507.			
R-605		RESISTOR: Fixed; carbon; 18,000 ohms ± 10%; 1 watt.	Cathode bias	AB GB	TR 601.1831
R-606		RESISTOR: Same as R-321.	Cathode bias		
R-607	3RC30BE333K — —	RESISTOR: Fixed; carbon; 33,000 ohms ± 10%; 1 watt.	Plate load	AB GB	TR 601.3331
R-608		RESISTOR: Same as R-607.			
R-609	3RC30BE103K — —	RESISTOR: Same as R-308.	Cathode bias		
R-610	3RC20BE105K — —	RESISTOR: Same as R-207.	Grid leak		
R-611		RESISTOR: Fixed; same as R-607.	Plate load		
R-612		RESISTOR: Fixed; same as R-501.	Freq. compensation		
R-613		RESISTOR: Fixed; carbon; 1.2 megohms ± 10%; ½ watt.	Freq. compensation grid bias	AB EB	TR 605.1251

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R-614		RESISTOR: Fixed; carbon; 82,000 ohms ± 10%; ½ watt.	Grid bias	AB EB	TR 605.8231
R-615		RESISTOR: Fixed; same as R-607.			
R-616		RESISTOR: Fixed; same as R-607.			
R-617		RESISTOR: Variable; same as R-106.	Horizontal gain		
R-618	3RC20BE224K — —	RESISTOR: Fixed; same as R-311.	Freq. compensation		
R-619	3RC20BE225K — —	RESISTOR: Fixed; carbon; 2.2 megohms ± 10%; ½ watt.	Grid bias	AB EB	TR 605.2251
R-620	3RC30BE332K — —	RESISTOR: Fixed; same as R-304.	Cathode bias		
R-621	3RC30BE103K — —	RESISTOR: Fixed; carbon; 10,000 ohms ± 10%; 2 watt.	Plate load	Speer resistor SI-2	
R-622		RESISTOR: Fixed; same as R-621.			
R-623		RESISTOR: Fixed; same as R-319.	Plate load		
R-624		RESISTOR: Fixed; same as R-601.	Plate load		
R-625		RESISTOR: Fixed; carbon; 22,000 ohms ± 10%; 1 watt.	Plate load		
R-626		RESISTOR: Fixed; same as R-619.	Grid bias		
R-627	3RC20BE224K — —	RESISTOR: Fixed; same as R-311.	Grid leak		
R-636		RESISTOR: Fixed; carbon; 4,700 ohms ± 10%; ½ watt.	Cathode bias	AB EB	TR 605.4721
R-637	3RC20BE222K — —	RESISTOR: Fixed; same as R-204.	Decoupling		
R-701	2Z7284.71 — —	RESISTOR: Variable; dual section; 10,000 ohms and 25,000 ohms ± 20%; 1 watt; carbon; front taper B, rear taper U.	Vert. gain R-f gain		TR 650.002 TR 800.145
R-702	3RC20BE105K — —	RESISTOR: Fixed; same as R-207.	Sweep speed		
R-703		RESISTOR: Fixed; carbon; 75,000 ohms ± 10%; ½ watt.	Sweep speed	AB EB	TR 605.7531

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R-704	2Z7284.69 — —	RESISTOR: Variable; double section; carbon; one megohm; ± 20%; 2 watt.	Fine sweep Pulse shaper	A-B Type J	TR 650.105J
R-706	3RC20BE474K — —	RESISTOR: Fixed; carbon; 470,000 ohms ± 10%; ½ watt.	Grid bias	AB EB	TR 605.4741
R-707	2Z272-113 — —	RESISTOR: Variable; single section; carbon; linear taper; 250,000 ohms ± 20%; 2 watt.	Synch. control	AB Type J	TR 650.254E
R-708	3RC20BE333K — —	RESISTOR: Fixed; carbon; 33,000 ohms ± 10%; ½ watt.	Grid bias	AB EB	TR 605.3331
R-709		RESISTOR: Fixed; same as R-703.	Pulse form		
R-710	3RC20BE225K — —	RESISTOR: Fixed; same as R-619.	Grid bias		
R-711		RESISTOR: Fixed; same as R-207.	Pulse form		
R-712		RESISTOR: Variable; dual sect; carbon; 1 meg. ± 20%; 2 watts.	Horizontal centering	AB Type JJ	TR 650.105J
R-713	2Z7273-56 — —	RESISTOR: Variable; single-section; carbon; linear taper; 1 megohm ± 20%; 2 watts.	Sweep width control	AB Type J	TR 650.105K
R-714		RESISTOR: Fixed; carbon; 180,000 ohms ± 10%; ½ watt.	Heater bias	AB EB	TR 605.1841
R-716	3RC20BE221K — —	RESISTOR: Fixed; same as R-102.	Heater bias		
R-717		RESISTOR: Fixed; same as R-716.			
R-718		RESISTOR: Fixed; same as R-313.	Cathode ray tube bias		
R-719		RESISTOR: Fixed; carbon; 2.4 meg. ± 10%; ½ watt.	Cathode ray bias	AB EB	TR 605.2451
R-720	#RC20BE335J — —	RESISTOR: Fixed; carbon; 3.3 megohms ± 10%; ½ watt.	Cathode ray tube bias	AB EB	TR 605.3351
R-721		RESISTOR: Fixed; carbon; 100,000 ohms ± 10%; ½ watt.	Heater bias	AB EB	TR 605.1041
R-801		RESISTOR: Fixed; same as R-325.	Plate limiter		
R-802		RESISTOR: Fixed; same as R-706.	Grid leak	AB EB	TR 605.4741
R-803		RESISTOR: Fixed; same as R-621.	Plate voltage		
R-804		RESISTOR: Fixed; same as R-102.	Cathode current		
E-101		BOARD: Terminal; 2⅜″ x ½″ x ⅛″; three solder term; (two mtg. holes .149″.)	Resistor terminals chassis 1	TRC 732.121	TR C-1951
E-201		BOARD, Terminal: 2⅛″ x 15/16″ x ⅛″; six solder terms; (two mtg. holes .149″ diam.)	Resistor terminals chassis 2	TRC 732.122	TR C-1952

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E-202		BOARD: Terminal 2⅛" x 1¼" x ⅛"; eight solder terms; two mtg. holes .149" diam.)	Resistor terminals chassis 2	TRC 732.123	TR C-1952
E-301		BOARD: Terminal ¾" x 1 15/16" x ⅛"; two holes .149"; three solder terms.	Resistor terminals chassis 3	TRC 732.124	TR C-1953
E-302		BOARD: Terminal 2" x 2⅛" x ⅛"; ten solder terms; two mtg. holes .149".	Resistor terminals chassis 3	TRC 732.125	TR C-1953
E-303		BOARD: Terminal 2¾" x 2" x ⅛"; nine solder term; three mtg. holes .149".	Resistor terminals chassis 3	TRC 732.126	TR C-1953
E-304		BOARD: Terminal ¾" x 7/16" x ⅛"; one solder term; one mtg. hole .149".	Resistor terminals chassis 3	TRC 732.130	TR C-1953
E-506		BOARD: Terminal 3 solder term; 8 7/16" x 1⅜" x ⅛"; (two holes ¾"; four mtg. holes ⅜"; one hole ½".)	Insulate potentiometers chassis 5	TRC 732.132	TRC Dwg. 1566B
E-504		BOARD: Terminal 1 7/8" x 1 7/8" x ¼"; four mtg. holes, one central 1¼" hole.	Insulate high voltage socket chassis 5	TRC 732.134	
E-506		BOARD: Terminal 2½" x 1⅝" x ⅛"; twelve solder term; (two mtg. holes .149" diam.)	Resistor terminals chassis 6	TRC 732.135	TR C-1956
E-603		BOARD: Terminal 2½"x1⅝"x⅛"; twelve solder term; in mounted holes, 149 diam.	Resistor terminals chassis 6	TRC 732.12	TR C-1956
E-604		BOARD: Terminal; 1 7/8" x 2½" x ⅛"; ten solder term; three mtg. holes .128" diam.)	Resistor terminals chassis 6	TRC 732.136	TR C-1956
I-303		SHIELD: Miniature tube; anti-corrosion plated; 13/16" diameter x 1 9/16"; retaining spring.	6AG5 tube retainer and shield	Cinch 8674	TR 871.002
I-304		SHIELD: Same as I-303.			
E-605		BOARD: Terminal; same as E-304.	Mount resistor 6 chassis	TR 732.130	TR C-1956
E-709		BOARD: Terminal; same as E-304.	Mount resistor 7 chassis	TR 732.130	TR C-1957
S-302		SHIELD: Same as S-101.			TRC C918C
I-101		SHIELD: Miniature tube; anti-corrosion pl; 1⅜" x ¾"; retaining spring.	6 AK5 tube retainer and E. S. shield	Cinch 8673	TRC 871.001
S-101		SWITCH: Rotary; ceramic base; four position, three pole; phosphor bronze contacts, silver plated; 2¾"x2" overall.	Channel selection	Globe Union	TRC A 1297 A 1290 TR 800.130
S-701		SWITCH: Rotary; ceramic base; four position, three pole, single-section (two double contact blades); overall dimen. 2¾" x 2".	Channel selection	Globe Union	TRC 800.132

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S-702	3Z9825-31.3 — —	SWITCH: Rotary; ceramic base; two pole, five position, single-section; dimen. 1 7/8" x 1 5/8".	Synch. selector	Globe Union	TRC 800.142
S-703		SWITCH: Rotary; ceramic base; two pole, five position, three sections; overall dimen. 1 7/8" x 1 5/8".	Sweep speed selector	Globe Union	TRC 800.143
S-704		SWITCH: Rotary; part of R-701.	Vert. gain control		
S-705		SWITCH: Toggle; SPST; black bakelite; 1" x 1/2" x 1/2"; (bushing 1/2" diam. x 1/2" lg.)	Power control	C-H 8801-K7	TR 801.509
X-504	2Z8684-14 — —	SOCKET: Cathode ray tube; 2 1/4" diam. x 1 1/8" deep; 14 terminals; brown bakelite.	Mounts C. R. tube	TR	TR 761.523
X-101		SOCKET: Tube; receiving; ceramic shell; 1 5/16" x 1 1/16" x 3/4"; (button base; mtg. centers 1/8" diam. x 1/8" on centers.)	Tube mount	Eby. SO-14C	TR 761.528
X-102		SOCKET: Tube; octal; ceramic shell; 2" x 1 3/8" x 7/8" (mtg. centers 1 5/8").		Ucinit 115001-1	TR 761.508
H-503		CLAMP: Tube; steel; cadmium pl; 2 bolts; 2 3/16" diam. x 59/64" h; comb. cr. tube and socket clamps with two setscrews; 3 mounting feet; anti-corrosion construction.	Secures 3BPI	TR 235.127	TRC A-1528
H-504		CLAMP: Tube; stainless steel; base diam. 1.377"; 3/4" h; strap type with screwdriver slot in locking piece.	Secures 5R4GY	Birtcher 926-C-8	TRC 235.126
E-711		VISOR: Cathode ray tube; 4" diameter x 3/8" deep, flange 5/16" wide; three holes in flange 1/4" x 7/16"; carries lumarith screen.	Shields CR screen	TR 785.001 725.005	TRC A-1028 A-1027 A-1026
H-502		WRENCH: Allen head screw "L" shaped; overall dimen. 1 3/4" x 5/8"; tool steel.	Tightening screws	ME No. 6	TR 980.002
X-401		SOCKET: Tube; same as X-102.			
X-405		SOCKET: Tube; same as X-102.			
X-501		SOCKET: Tube; same as X-102.			
X-503		SOCKET: Tube; same as X-101.			
P-101		CONNECTOR: Male contact; 5 banana pins on 5/16" rod; straight type; mica wafer, 3/32" diam pins; (flat sq aluminum body; natural finish; 4 mtg holes 1 1/16" c to c).	Mounts IF coils	TR	TR 761.531 TR C-1575 TR C-1562
P-102		CONNECTOR: Male contact; same as P-101.			
P-103		CONNECTOR: Male contact; same as P-101.			
P-104		CONNECTOR: Male contact; same as P-101.			

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P-105		CONNECTOR: Male contact; same as P-101.			
S-102		SWITCH: Rotary; same as S-101.			
I-201		SHIELD: Tube; same as I-101.			
I-102		SHIELD: Tube; same as I-101.			
I-203		SHIELD: Tube; same as I-101.			
I-204		SHIELD: Tube; same as I-101.			
J-201		MOUNTING: Female connector; phenolic strip; 2¾″ x ½″ x 5/16″; (five banana jacks, 5/16″ on centers; two .257 holes 2¼″ on centers).	Terminals No. 2 chassis	TR 554.017	TR C-1952
J-202		MOUNTING: Female connector; phenolic strip; 3 1/16″ x ½″ x 5/16″; (six banana jacks, 5/16″ on centers; two .257 holes 3½″ on centers).	Terminals No. 2 chassis	TR 554.015	TR C-1952
P-201		CONNECTOR: Male contact; same as P-101.			
P-202		CONNECTOR: Male contact; 7 cont; 2″ x 2″ x ⅛″; (phenolic; triple RF coil can assembly).	Secures osc coil assembly	TR	TR 761.534 TR A-1395
P-203		CONNECTOR: Male contact; 6 cont; 6 banana plugs, silver pl brass, 5/16″ on centers; 2 15/16″ x 7/16″ x 3/16″; (phenolic; two holes .149″, 2 9/16″ on centers).	Terminals No. 2 chassis	TR 554.026	TR C-1953
P-204		CONNECTOR: Male contact; 5 cont; 5 banana plugs, silver pl brass, 5/16″ on centers; 2 5/8″ x ½″ x 3/16″; (phenolic; two holes .149″, 2½″ on centers).	Terminals No. 2 chassis	TR 554.004	TR C-1952
S-201		SWITCH: Rotary; same as S-101.			
S-202		SOCKET: Rotary; same as S-101.			
X-201		SOCKET: Tube; same as X-101.			
X-202		SOCKET: Tube; same as X-101.			
X-203		SOCKET: Tube; same as X-101.			
X-204		SOCKET: Tube; same as X-101.			
I-301		SHIELD: Same as I-101.			
I-302		SHIELD: Same as I-101.			
P-301		CONNECTOR: Male contact; same as P-101.			
S-301		SWITCH: Same as S-101.			

MODEL: PANORAMIC ADAPTER AN/APA-10

Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or AWS Type*	*Cont. or Govt. Dwg. or Spec. No.*
X-301		SOCKET: Same as X-101.			
X-302		SOCKET: Same as X-101.			
X-303		SOCKET: Same as X-101.			
X-304		SOCKET: Same as X-101.			
E-505		BOARD: Terminal; 6 solder term; phenolic strip; 2″ x 1⅝″ x ⅛″; (two mtg holes .152″ diam; two mtg holes .128″ diam; socket hole ⅝″ diam).	Insulate 6AK5 No. 5 chassis	TR 732.138	TR C-1955
E-507		BOARD: Terminal; 3 solder term; phenolic strip; 10⅛″ x 2″ x ⅛″; (two mtg holes .152″ diam).	Mount Resistors No. 5 chassis	TR 732.146	TR C-1955
E-508		CLIP: Tube plate contact; black bakelite; overall dimen 1½″ diam x 1½″ d; (insulated; type No. APW-4484B wire; with 12″ lead 20 gage.	Cap for high voltage rectifier	Alden No. 91TINL	TR 235.117
I-501		SHIELD: Tube; nu-metal .021″ thk; black enamel finish; 7¾″ x 2¼″ diam; (spot welded at 6 spots; annealed).	Shields CR tube	TR	TR 733.221 TR C-918
I-503		SHIELD: Same as I-101.			
P-501		CONNECTOR: Male contact; 10 cont; 10 banana plugs, silver pl brass, 5/16″ on centers; 2 9/16″ x 13/16″ x 3/16″; (phenolic; two columns of five ea).	Terminals No. 5 chassis	TR 554.024	TR C-1955
X-502		SOCKET: Tube; 4-prong; ceramic; 1 7/8″ x 1 7/8″ x 3/16″; (two mtg holes, centrally located hole 1¼″ diam).	Mounts 2 x 2 tube	Amphenol No. RSS4	TR 761.503
J-601		MOUNTING: Female connector; phenolic strip; 2⅛″ x 1⅝″ x ⅛″; (13 banana jacks 5/16″ on centers; 3 columns; four .144″ holes 1⅛″ and 1¾″ on centers; 1 .144″ hole).	Terminals No. 6 chassis	TR 554.021	TR C-1956
X-601		SOCKET: Tube; same as X-102.			
X-602		SOCKET: Tube; same as X-102.			
X-603		SOCKET: Tube; same as X-102.			
X-604		SOCKET: Tube; same as X-102.			
E-705		KNOB: Bar; die cast aluminum; for ¼″ shaft; double 6-32 set screws; arrow marking; 1 11/16″ lg x ¾″ h.	Channel selector control	Advanced Pressure Castings, Inc.	TR 431.128
E-706		BOARD: Terminal; 20 solder term; phenolic strip; 9″ x 2″ x ⅛″ thk; (6 mtg holes .177″; two fuse clips).	Mount resistors No. 7 chassis	TR 732.145	TR C-1957
E-707		BOARD: Terminal; phenolic strip; 2″ x 1½″ x ⅛″; (3 mtg holes .116″ diam).	Mount capacitors No. 7 chassis	TR 732.141	TR C-1957
E-708		BOARD: Terminal; 2 solder term; phenolic strip; 1¾″ x ⅜″ x ⅛″; (one mtg hole .149″ diam).	Mount resistors No. 7 chassis	TR 732.142	TR C-1957

TABLE OF PARTS

Note

Parts listed which are indicated by a # sign in column 2 are not available as spare parts and are listed for reference purposes only.

MODEL: PANORAMIC ADAPTER AN/APA-10

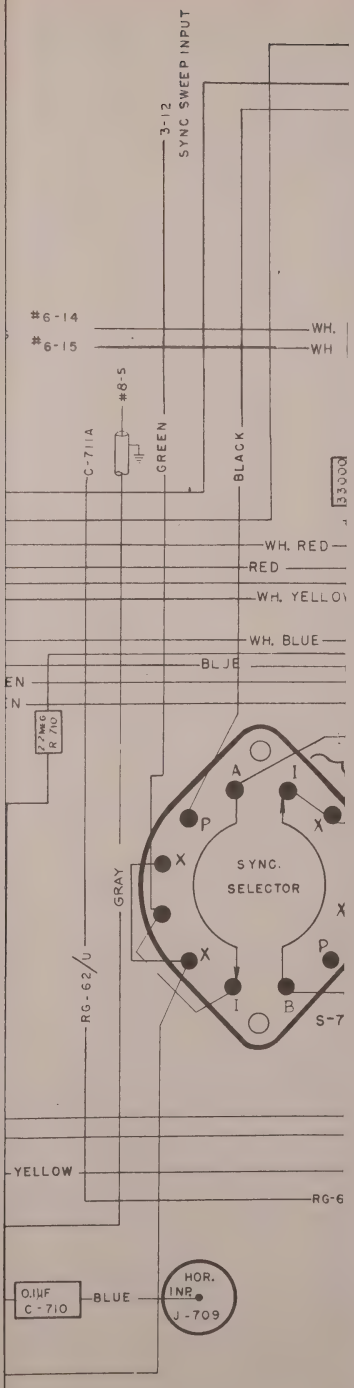
Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or AWS Type*	*Cont. or Govt. Dwg. or Spec. No.*
E-710		LAMP: Incandescent (for I-701).			
E-712		LAMP: Incandescent; 6.3 v, 0.25 a; miniature bayonet base.		GE Mazda Type 47	
I-701		LIGHT: Indicator; black nickel finish; dial light; (bayonet base, miniature; light intensity increases clockwise with .047″ pinhole).	Pilot lamp	Dialco DV-9653-SL	TR 572.108
J-706		JACK: Telephone; same as J-705.	B audio input	Mallory No. SCA-2B	TR 421.512
J-708		CONNECTOR: (Male and female contact); coaxial; silver pl; Female D166-367 w/ mtg lug 7/16″ x 1/2″, single mtg hole 1/8″ diam; Male D166366; assem 1 3/4″ lg x 7/16″ diam; (polystyrene insulation).	Horizontal input	Ucinite No. 118132	TR 582.122
J-709		CONNECTOR: Same as J-708.			
J-710		CONNECTOR: Same as J-708.	Synch input		
J-711		CONNECTOR: Female contact; coaxial; Sig C type No. SO-239; (four mtg holes .718″ on centers, .1285″ diam).	"A" channel input	Amphenol No. 49194	TR 265.019
J-712		CONNECTOR: Same as J-711.	"B" channel input		
J-713		CONNECTOR: Same as J-711.	"C" channel input		
O-701		DETENT: Mechanism; steel (stock); cadmium pl; 4 positions; set screw; two mtg holes.	Locate selector switch positions	Globe-Union	TR A-1325 TR A-1364 TR 800.135
O-702		SHAFT: Switch; stainless steel; polish finish; .1855A sq; 14-5/8″ lg.	Selector switch	TR	TR A-1334 TR 800.137
P-701		CONNECTOR: Male contact; four term; receives plugs AN3106-22-4S or AN-3108-22-4S; 1 5/8″ lg x 1 5/8″ sq; (four mtg holes 1 1/4″ on centers, 3/32″ diam; power).	Power connections	Amphenol AN3102-22-4P	TR 265.014
P-801		CONNECTOR: Male contact; six cont; six banana plugs, silver pl brass, 5/16″ on centers; 2 15/16″ x 7/16″ x 3/16″; (phenolic; two holes, .257″ diam).	Terminals No. 8 chassis	TR 554.128	TR C-1882
J-801		MOUNTING: Female connector; phenolic strip; 3/16″ x 7/16″ x 1/8″; (six banana jacks 5/16″ on centers; two holes, .257″ diam, 2 9/16″ on centers).	Terminals No. 8 chassis	TR 554.028	TR C-1882
X-801		SOCKET: Tube; same as X-101.			

LIST OF MANUFACTURERS AND ABBREVIATIONS

Manufacturer	*Abbreviation*
Alden Products Co.	AL
Allen Bradley Co.	AB
American Steel Package Co.	ASP
Birtcher	BI
Capacitron	CA
Canfield Rubber Co.	CF
Centralab	CE
Chicago Telephone	CT
Cinch Manufacturing Co.	CI
Clarostat Mfg. Co. Inc.	CL
Crowe Nameplate	CR
Cutler Hammer Co., Inc.	CH
Electromotive Mfg. Co.	EL
Erie Resistor Corp.	ER
General Electric Co.	GE
Instrument Specialties	IS
Lafayette	LAF
Landan	LA
Littlefuse	LI
Mallory	MAL
Marchand	MA
Mersick	ME
Micamold Radio Corp.	MI
McLeod Ward	McLW
Multiproducts Tool Co.	MP
National Co.	NA
Patton-Mac-Guyer Co.	PM
Porter Metal Products	PO
Radio Corp. of America	RCA
Raytheon Mfg. Co.	RA
Solar Mfg. Co.	SO
Speer Resistor Corp.	SR
Sprague Specialties Co.	SP
Standard Coil Products Co.	SC
Templetone Radio Co.	TRC
Tobe Deutschman Corp.	TO
Uinite Co.	UC
United Transformer Co.	UTC

SECTION VIII

DRAWINGS


3-12
SYNC SWEEP INPUT
#6-14
#6-15
WH.
WH
#8-5
C-711A
GREEN
BLACK
WH. RED
RED
WH. YELLO
WH. BLUE
BL JE
EN
N
A
I
P
X
SYNC.
SELECTOR
GRAY
RG-62/U
B
S-7
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INP.
J-709

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AN 08-30APA10-3

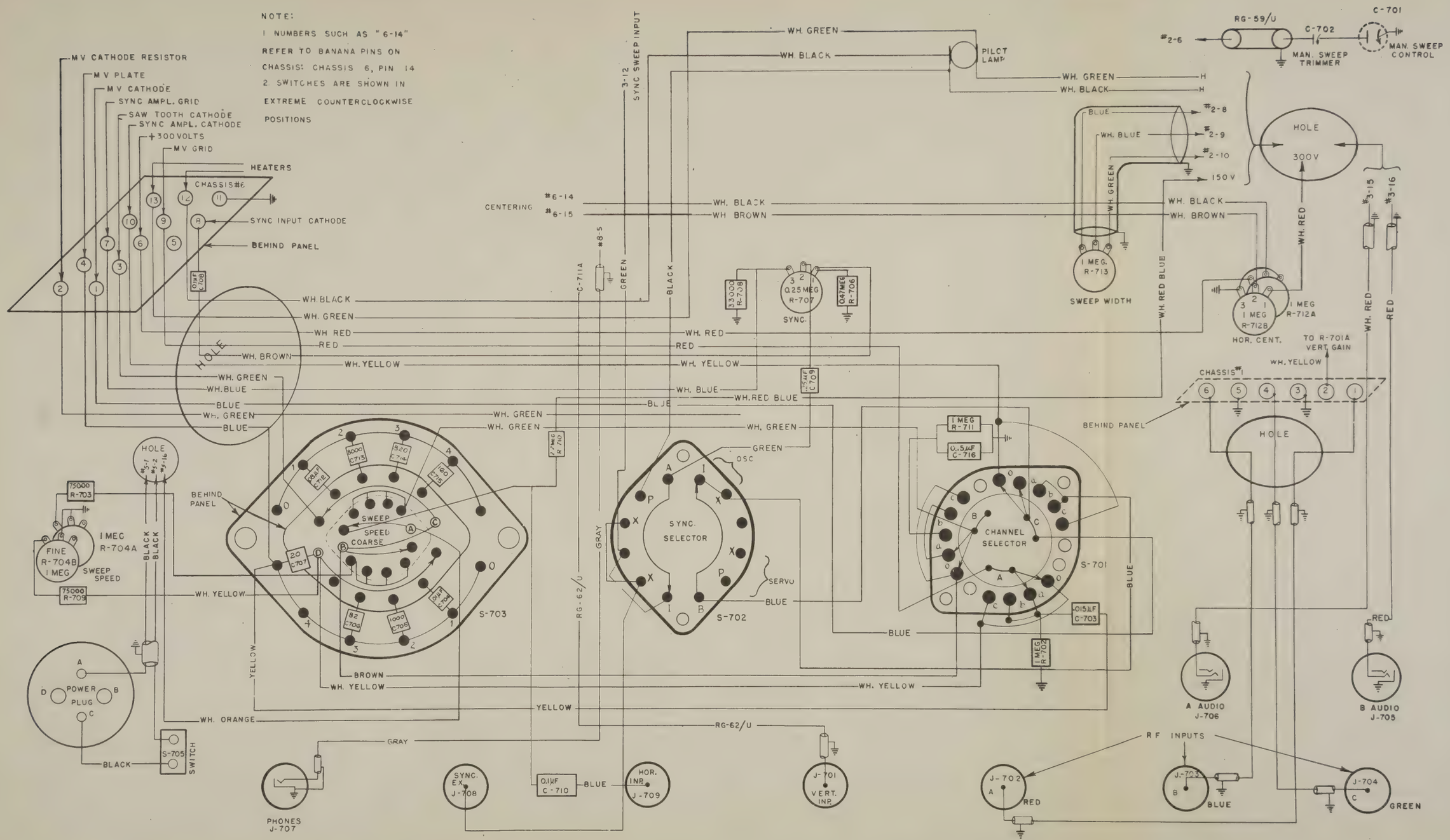

Figure 8-1. Indicator ID-60/APA-10—Front Panel Wiring Diagram

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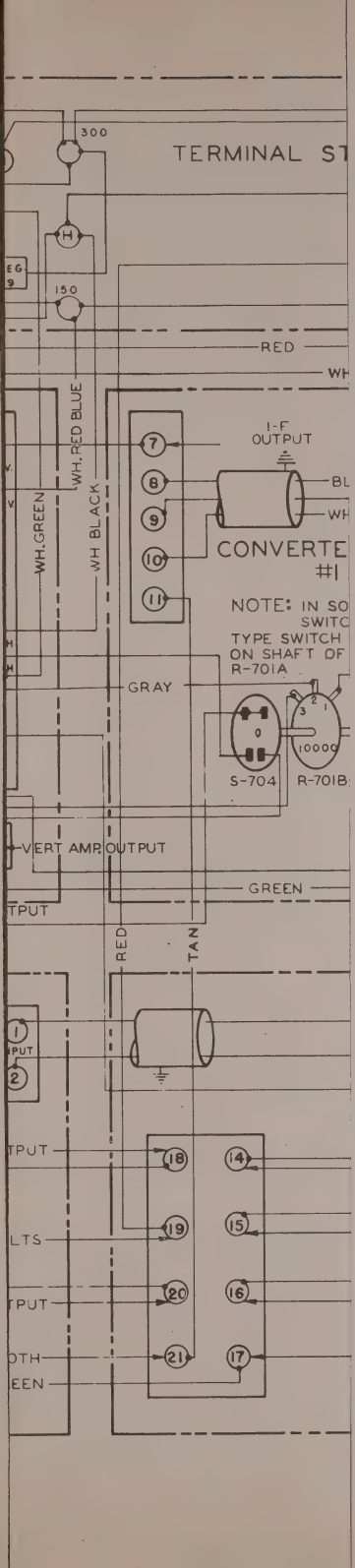
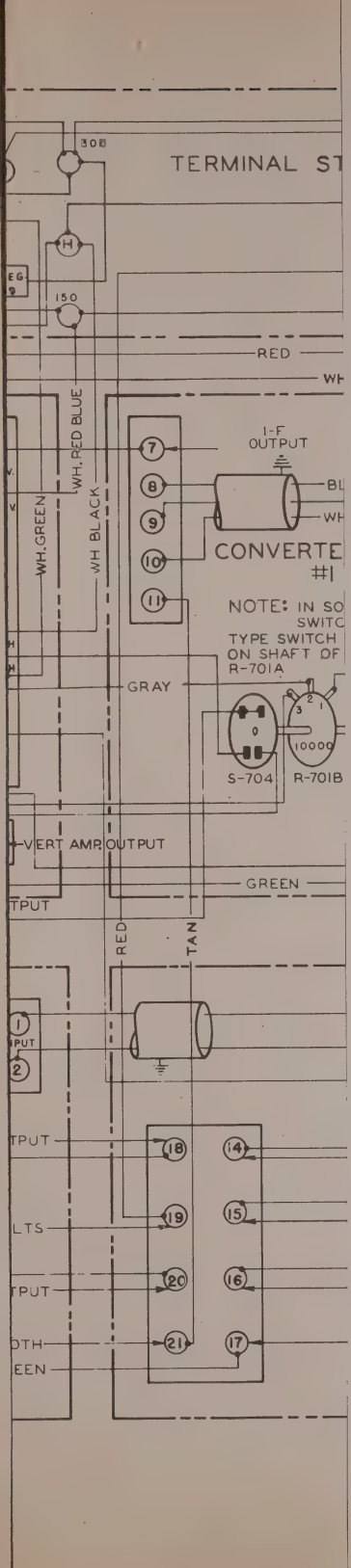

TERMINAL ST
300
150
RED
WH
WH. RED BLUE
WH. GREEN
WH BLACK
I-F OUTPUT
CONVERTE
#1
NOTE: IN SO
SWITC
TYPE SWITCH
ON SHAFT OF
R-701A
GRAY
S-704
R-701B
VERT AMP. OUTPUT
GREEN
RED
TAN
10000


TERMINAL ST
308
H
EG
150
RED
WH
WH. RED BLUE
WH. GREEN
WH BLACK
7
8
9
10
11
I-F
OUTPUT
BL
WH
CONVERTE
#1
NOTE: IN SO
SWITC
TYPE SWITCH
ON SHAFT OF
R-701A
GRAY
2
3
1
0
10000
S-704
R-701B
VERT AMP. OUTPUT
GREEN
TPUT
RED
TAN
PUT
1
2
TPUT
18
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LTS
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TPUT
21
17
DTH
EEN

RESTRICTED
AN 08-30APA10-3

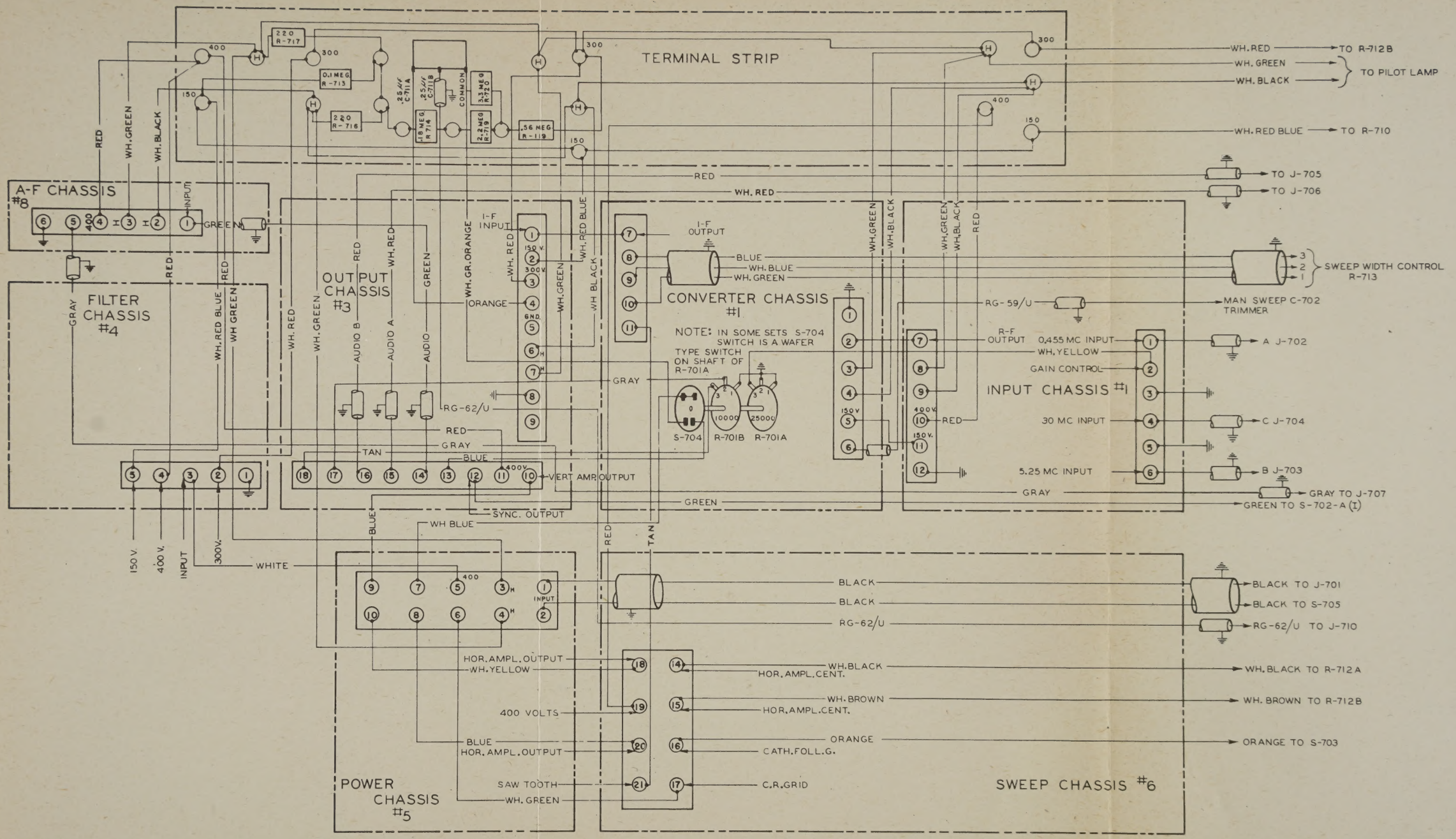


Figure 8-2. Indicator ID-60/APA-10—Top View, Chassis Wiring Diagram

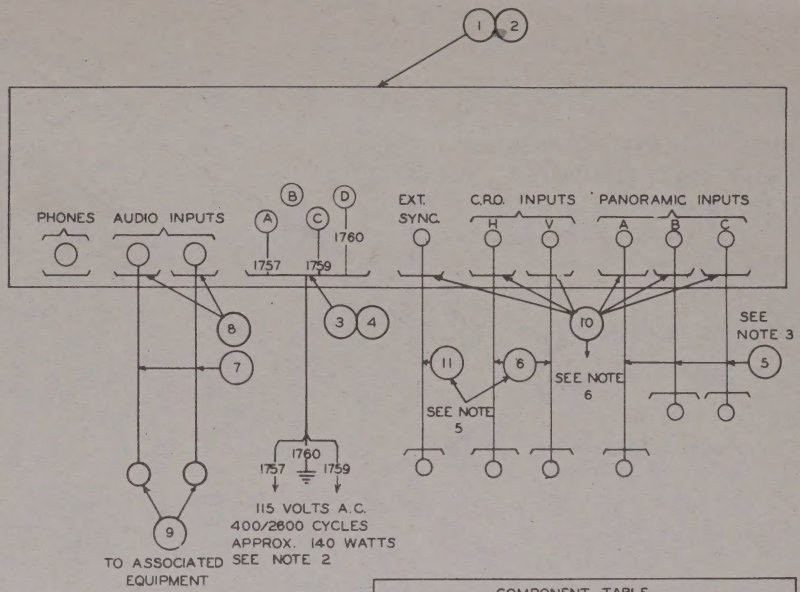
WIRE TABLE

ALL WIRES TO BE AIRCRAFT CABLE PER SPEC. AN-J-C-48 UNLESS OTHERWISE SPECIFIED.

+INDICATES WIRES TO BE INDIVIDUALLY SHIELDED PER SPEC. 95-27273.

⊗ INDICATES WIRES WHOSE VOLTAGE DROP MUST NOT EXCEED LIMITS OF SPEC. 95-32310

REF NOTE	WIRE NO.	MAXIMUM OPERATING VOLTAGE	MAX. ALLOWABLE RESISTANCE IN OHMS (71°C)	MINIMUM CABLE SIZE PERMITTED
4	1757	115 A.C.	0.400	AN 20+⊗
4	1759	115 A.C.	0.400	AN +⊗
	1760	0	0.002	AN 20



6 THESE ADAPTERS M-359 WILL BE USED AS INSTALLATION DEMANDS REQUIRE.

5 THESE TEST CORDS HAVE PLUG D-166366 ON ONE END OF RADIO FREQUENCY CABLE RG-59/U AND THE OTHER END TERMINATES IN ALLIGATOR CLIPS.

4 WIRES 1757 & 1759 SHALL BE SHIELDED WHEN ROUTED CLOSE TO AND PARALLEL TO SKIN OF AIRPLANE FOR ANY LENGTH GREATER THAN THREE FEET. THESE WIRES MAY BE ALREADY INSTALLED ON RAVEN EQUIP. RACK AND CONNECTED TO TERMINAL STRIP IN TERMINAL BOX J-49/A.

3 CORD CD-800 IS PROCURED IN TWO (2) LENGTHS, 20 AND 30 INCHES. THE LATTER IS TO BE CONNECTED TO SOCKET A. THE CORD CONSISTS OF RADIO FREQUENCY CABLE RG-8/U AND PLUG D-166366 ON EACH END. RIGHT ANGLE ADAPTERS M-359 MAY BE USED ON THESE CORDS WHERE NECESSARY.

2 POWER PLUG AN 3108-22-4S MAY BE ALREADY INSTALLED ON RAVEN RACK AND WIRE 1759 (ONE SIDE OF A.C.) MAY BE GROUNDED IN WHICH CASE A JUMPER BETWEEN PIN C AND D MAY BE INSTALLED IN PLACE OF WIRE 1760.

1 ALL TERMINAL STRIPS REQUIRED IN THE INSTALLATION OF THE WIRING SHALL BE MADE OF SUITABLE INSULATING MATERIAL AND WITH TERMINAL SPACING TO PROVIDE AGAINST VOLTAGE BREAKDOWN.

COMPONENT TABLE

	ITEM	QUAN. REQD	EQUIPMENT NOMENCLATURE DESCRIPTION	EQUIPMENT NOMENCLATURE TYPE NO.	SPEC. OR INSTALLATION DRAWING
*	1	1	INDICATOR	ID-60/APA-10	H44G3448
*	2	1	MOUNTING	MT-171/U	H44G3448
*	3	1	PLUG	AN 3108-22-4S	AN9534
*	4	1	ADAPTER	AN 3057-12	AN3057
*	5	3	CORD (SEE NOTE 3)	CD-800	
*	6	2	CORD (SEE NOTE 5)	CG-53/AP	
*	7	AS REQD	CORDAGE	CO-119B	
*	8	2	PLUG	PL-68	
*	9	2	PLUG	PL-55	
*	10	6	ADAPTER (RT. ANGLE) SEE NOTE 6	M-359	H43G11747
*	11	1	CORD (SEE NOTE 5)	CG-113/AP	

* INDICATES GOVERNMENT FURNISHED EQUIPMENT

Figure 8-3. Panoramic Adapter AN/APA-10—Cable Diagram

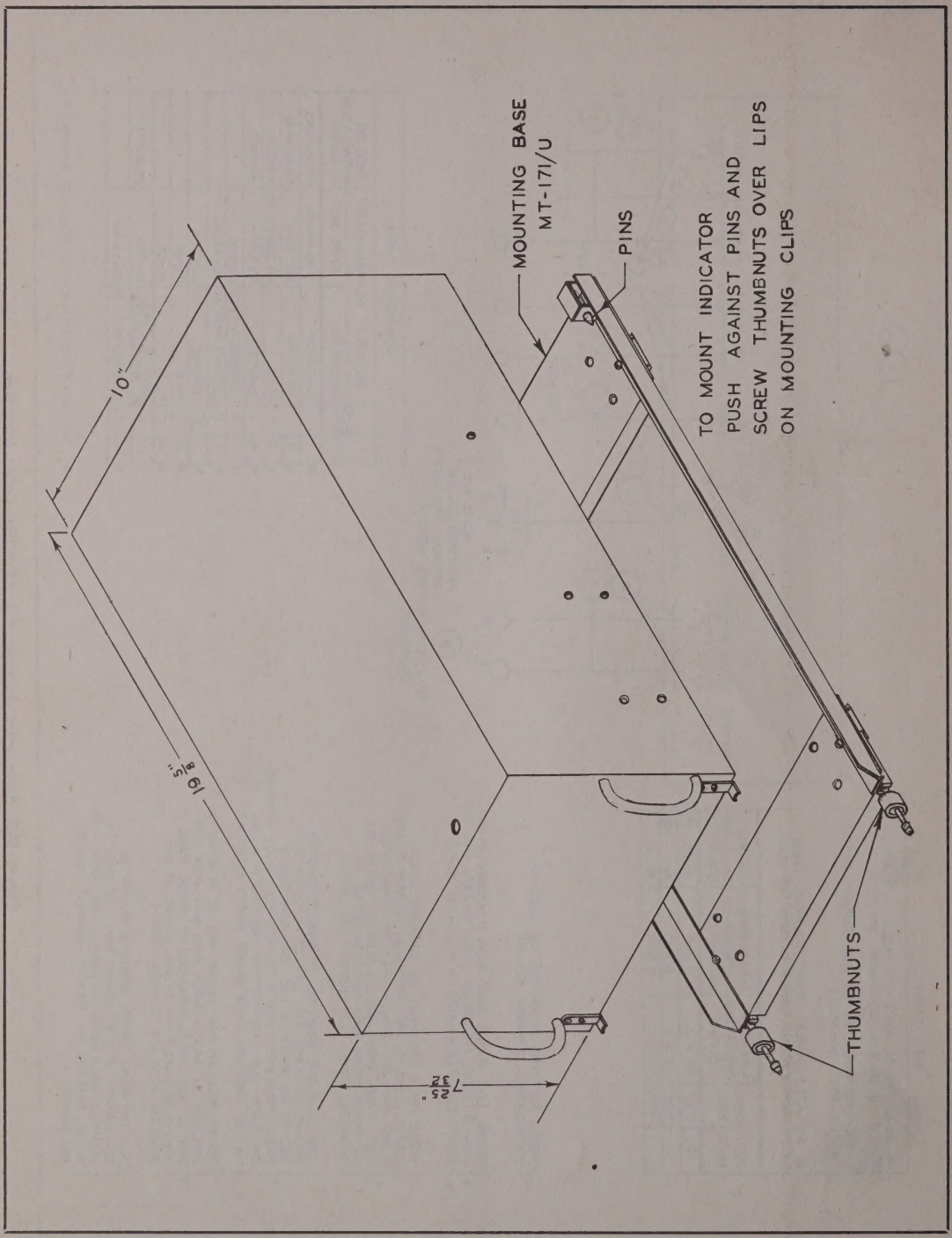


Figure 8-4. Panoramic Adapter AN/APA-10—Dimensional Sketch